Chapter 2
Project Description

2.1 Introduction

DWR and Reclamation have agreed to jointly pursue the development of the SDIP to address the needs of the aquatic environment as well as the regional and local water supply needs. Overall, the SDIP components are intended to meet the project purpose and objectives by balancing the need to reduce the downstream movement of Central Valley fall-/late fall–run Chinook salmon of the San Joaquin River watershed into the south Delta via the head of Old River and ensure water of adequate quantity and quality for agricultural diverters in the south Delta, with the need to increase the current permitted maximum diversions at the SWP's CCF (from 6,680 cfs to 8,500 cfs). Several regulations are in place to protect water quality, fish, water stage, and other important resources. The proposed increase in diversions to CCF would occur only when these current regulations are met.

2.2 Consultation History

The impacts of the operational component of the SDIP on listed fish are described, analyzed, and authorized through the OCAP (Bureau of Reclamation 2004) and the OCAP BOs, issued by the USFWS (U.S. Fish and Wildlife Service 2004, 2005 and NOAA Fisheries 2004). This ASIP analyzes impacts of gate construction and operation and channel dredging on state-listed plant species and federally listed and state-listed wildlife species.

2.3 Project Construction Details

Activities described and analyzed in this ASIP are only the SDIP Stage 1 actions that are not addressed through other consultation. These are:

- construction and operation of the head of Old River fish control gate and the Old River at DMC, Middle River, and Grant Line Canal flow control gates; and
- channel dredging in Old River, Middle River, and West Canal.

The fish control structure is intended to prevent outmigrating San Joaquin River Central Valley fall-/late fall–run Chinook salmon from entering Old River from the San Joaquin River, thus reducing exposure to the SWP Banks and CVP Tracy pumping and fish salvage facilities. The flow control gates are intended to assist in maintaining water levels and water quality for south Delta agricultural users. Dredging is intended to improve water conveyance and the operation of private agricultural siphons and pumps.

During construction, tidal emergent wetlands and riparian habitat will be avoided outside of areas that will be permanently disturbed (i.e., gate footprints). Details on the location, design, construction, maintenance, and other related project components are provided below. The gate construction schedule is described below and presented in Table 2-1.

2.3.1 Gate Construction

Table 2-1. Gate Fabrication and Construction Schedule

	Fabrication and Construction		
Barrier	Begins	Ends	Duration (months)
Head of Old River	September 2006	April 2009	32
Middle River	September 2006	April 2009	32
Grant Line Canal	September 2006	April 2009	32
Old River at DMC	September 2006	April 2009	32

No in-the-wet construction outside sheetpiles and sediment curtains would occur between December 1 and July 31.

DMC = Delta-Mendota Canal.

The major components of the four gates would be constructed using an in-the-wet method. This method would involve working in the natural channel without impeding the flow of water. Each gate would be constructed within the confines of the existing channel, and levees would not be relocated. All in-water work, including the construction of sheetpile walls and pile foundations, placing rock bedding and stone slope protection, and dredging, would occur between August 1 and November 30 to minimize impacts on delta smelt and juvenile salmonids. Thus, gate construction would not affect VAMP experiments. Construction of all other components would take place from a barge or from the levee crown and would occur throughout the year. Any work performed in the channel after November 30 would be done from a barge and within a silt curtain or similar containment system. The containment system would be installed in the work area between August 1 and November 30. In addition, the temporary barriers would continue to be installed in south Delta channels until the permanent gates become fully operable.

Construction of each gate would involve several tasks. First, before constructing the flow control gate, the foundation would be prepared. The channel invert would be excavated to grade using a sealed clamshell dredge working off the levee or a barge, depending on the presence of sensitive habitats and other restrictions. Two rows of sheetpiles would be placed under the gate to provide both upstream and downstream cutoff walls that would restrict flow paths beneath the new gate and act as retaining walls during other stages. The area between the sheetpiles would then be covered with a layer of graded rock. Foundation piles (H-piles) and jacking piles (pipe-piles) would be driven in the sheetpiles. The H-piles would support the gate structures, and the pipe-piles would be used to level the structure during placement. A series of large-diameter steel pipe-piles also would be installed to act as guide piles to help position and lower the control gates into place. The guide piles would be removed once the flow control structures are in place.

Second, pneumatically operated bottom-hinged gates ranging from 10 to 20 feet high would be installed. The gates would be attached to concrete foundations and would be constructed off site and transported to the gate sites. The gates control flow. When the gates are open, the gates are entirely below the water surface. The gates are closed by raising them so that they are elevated above the water surface. Hollow concrete shell segments would be prefabricated in a casting yard. The steel control gates, air bladders, and air piping would be attached to the shell segments in the yard. The segments would be either floated to the gate locations using flotation tanks or brought in on a crane barge. The concrete segments then would be lowered into place and secured to the foundation piles. The interior compartments of the precast segments would be filled with a concrete grout to complete the gate structure. Divers would make the final connections of the air piping and electrical conduit for the control gates.

Thirdly, a boat lock would be constructed at all of the gates, except for the Middle River gate. The boat lock would be constructed using sheetpiles and would include a bottom-hinged gate on each end. The boat lock would be 20 feet wide, 70 feet long, and 10 feet high. Each gate would be opened and closed using an air-inflated bladder. Boats traveling upstream would enter the lock, and then the downstream gate would close. Water would flow into the lock by partially lowering the upstream gate. Once the lock is filled, the upstream gate would be completely lowered, allowing the boat to pass. For boats traveling downstream, the procedure would be reversed.

A small building for the operator would be located above or adjacent to the control building to provide the boat lock operator with an unobstructed view of the lock chamber. The building also would house the controls for the boat lock gates.

The balance of the gate construction, including the abutments, control/operator buildings and equipment installation, access platforms and ramps, boat ramps, communication equipment installation, access roads, and spoil and staging areas, would be accomplished either from a barge or from land.

Fencing and gates would control access to the structure. A communications antenna for telephone and telemetered data transmission would be constructed, and a propane tank for emergency power backup would be on site. Details specific to each gate location, such as approximate amounts of materials, access routes, and associated structures, are described below.

Maintenance

Periodic maintenance of the gates would occur every 5–10 years. Maintenance of the motors, compressors, and control systems would occur annually and require a service truck. Maintenance dredging around the gates would be necessary to remove accumulated sediment deposits. This dredging will be addressed in a separate consultation when more information is available.

2.3.1.1 Fish Control Gate

Head of Old River

Location

The head of Old River fish control gate (–121.328513, longitude; 37.808166, latitude) would be located at the divergence of the head of Old River and the San Joaquin River (Figure 1-1).

Design and Construction

The head of Old River gate (Figure 2-1) would be approximately 210 feet long and 30 feet wide, with top elevation of 12 feet (1988 North American Vertical Datum [NAVD]). This fish gate would consist of seven bottom-hinged gates approximately 125 feet in total length. Other components associated with the gate would include a fish passageway, boat lock, combined control/boat lock operator building, and communications antenna. Appurtenant components associated with the structure would include log booms, floating and pile-supported warning signs, water-level recorders, and navigation lights.

The boat lock would include a 20-foot-wide-by-70-foot-long lock. The lock would be equipped with floating boat docks for temporary mooring, navigation signs and lights, warning signs, and video surveillance capability.

The fish passageway would consist of a vertical-slot fishway. The fishway would be approximately 40 feet long and 10 feet wide and constructed with reinforced concrete. The ladder would be closed during the spring and opened during the fall. Stoplogs would be used to close the ladder.

For construction, people and equipment would access the project mainly from the south on a county road. The north access road is currently a dirt road, and approximately 2 miles of it would need to be improved during construction of the gate. The road would be improved using gravel, would be at least 16 feet wide, and would accommodate cranes and loaded 10-wheel trucks. The road would begin at the end of Undine Road and proceed east directly to the San Joaquin River levee. The road would then go south and west along the levee to the gate

site. A construction staging area (approximately 10,000 square feet) would be located on agricultural land on the south side of Old River just south of the county roads. For periodic maintenance of the gate, the county road to the south of the gate would be used.

The complete gate would be constructed with approximately 1,500 cubic yards of concrete. The gate would have a permanent storage area, 180 by 60 feet (10,800 square feet), for equipment and operator parking. A communications antenna for telephone and telemetered data transmission and a propane tank for emergency power backup also would be constructed.

Approximately 11,000 square feet (450 linear feet) of riprap would be used as slope protection on levees near the gate. The construction period is estimated to be up to 30 months, starting in April 2006 and ending in October 2008, with a maximum construction crew of 80 people.

2.3.1.2 Flow Control Gates

Three flow control gates, one each in Middle River (–121.482544, longitude; 37.885629, latitude), Grant Line Canal (–121.544434, longitude; 37.819324, latitude), and Old River (–121.544579, longitude; 37.810875, latitude), would be constructed and operated as a part of the SDIP. The operation of the three flow control structures would vary over the course of the agriculture irrigation season. This section describes the specific location, design, and construction of each gate.

Middle River Gate

Location

The proposed Middle River gate would be located in Middle River, San Joaquin County, near its confluence with Victoria Canal, North Canal, and Trapper Slough, approximately 13 miles southwest of Stockton (Figure 1-1).

Design and Construction

The Middle River gate (Figure 2-2) would be approximately 300 feet long and 20 feet wide. The flow control structure would include twelve 16-foot-wide bottom-hinged gates with a top elevation of 5.5 feet msl (1988 NAVD). Other components associated with the gate are a control building, boat ramp, communications antenna, log booms, floating and pile-supported warning signs, water-level recorders, and navigation lights.

Access/haul roads would involve the improvement of existing access roads in the immediate vicinity of the gate site and would be at least 16 feet wide and composed of gravel. Roads would accommodate large cranes (40 tons) and loaded 10-wheel trucks. Construction staging areas would be situated on agricultural lands on the north and south sides of the river and would be approximately 10,000 square feet each.

A permanent storage area, 50 feet by 25 feet (1,250 square feet), would be located next to the control building on the landside of the south levee and would be used to store equipment and provide vehicle parking. A 6-foot-high chain link fence with an access gate would surround it. Approximately 11,000 square feet (700 linear feet) of riprap would be used as slope protection on levees near the gate.

Construction of the Middle River gate would last up to 18 months, from April 2006 through November 2007, with a maximum construction crew of about 50 people.

Grant Line Canal Gate

Location

The Grant Line Canal gate would be located near the confluence of Grant Line Canal and Old River (Figure 1-1).

Design and Construction

The gate consists of two adjacent flow control structures, one in Grant Line Canal and the other in Fabian-Bell Canal. The Grant Line Canal gate consists of eight 16-foot-wide bottom-hinged gates, and the Fabian-Bell Canal gate consists of six 16-foot-wide bottom-hinged gates. The control structures would be supported on a pile foundation with a steel sheetpile cutoff wall.

Another sheetpile wall 210 feet long with the top of the wall at an elevation of 6.5 feet msl (NAVD 1988) would be constructed across the center island between Fabian-Bell and Grant Line Canals, connecting the two structures. Access/haul roads would be at least 16 feet wide and composed of gravel. Roads would accommodate large cranes (40 tons) and loaded 10-wheel trucks. A total of 15,250 linear feet on the north levee and 10,000 linear feet on the south levee would be paved with gravel to allow access to the project area. Construction staging areas would be situated on the north and south sides of the canal. The north and south staging areas would be located on agricultural land and would be approximately 100 feet by 100 feet each.

The boat lock and control structure would be constructed within the channel; therefore, relocation of the levees would not be necessary. The boat lock would include a 20-foot-wide-by-70-foot-long lock. The lock would be equipped with floating boat docks for temporary mooring, navigation signs and lights, warning signs, and video surveillance capability. The boat lock operator building would be on top of the control building adjacent to the boat lock, giving the operator an unobstructed view of the boat lock.

The gate also would include buried utility lines supplying electricity and communications to the area, access/haul roads, and an equipment storage area (Figure 2-3). Additional structures include a control building to house the control systems for the gates and the standby power source (propane).

Approximately 1,500 cubic yards of material and up to 600 linear feet of channel at and in the vicinity of the gate would be excavated using the sealed clamshell dredging method.

The northern permanent storage area would consist of a 25-foot-wide-by-50-foot-long area (1,250 square feet) enclosed by an access control gate and fence. In the storage area would be an emergency generator, fuel tank, and radio antenna to be used for telemetered data communication.

Approximately 15,400 square feet (900 linear feet) of the waterside slope of the levee near the gate would be protected with riprap.

Construction would last up to 30 months, beginning in April 2006 and ending in November 2008, with a maximum crew of 90 people.

Old River at DMC Gate

Location

The gate on Old River would be located east of the DMC approximately 4,000 feet southeast of the intersection of the Alameda, Contra Costa, and San Joaquin County lines (Figure 1-1).

Design and Construction

The gate would consist of a control structure equipped with eleven 16-foot-wide bottom-hinged gates with the top of the gates at an of elevation 5.5 feet msl (1988 NAVD). The control structure would be supported on a pile foundation with a steel sheetpile cutoff wall. The footprint of the flow control structure would be approximately 220 feet long and 20 feet wide.

Other components associated with the gate are a 20-foot-wide-by-70-foot-long boat lock (Figure 2-4), a control building, boat lock operator building, and communications antenna. The boat lock operator building would be on top of the control building adjacent to the boat lock, giving the operator an unobstructed view of the boat lock.

The gate would also have buried utility lines supplying electricity and communications to the area, access/haul roads, and an equipment storage area. Miscellaneous components associated with the structure would include floating and pile-supported warning signs, water-level recorders, and navigation lights.

A boat ramp would be constructed just downstream of the gate to allow maintenance boats to access the control gates. Access/haul roads would involve the improvement of existing access roads in the immediate vicinity of the gate site and would be at least 16 feet wide and composed of gravel. Roads would accommodate large cranes (40 tons) and loaded 10-wheel trucks. Construction staging areas would be situated on the north and south sides of the river and be approximately 10,000 feet square each.

Approximately 1,500 cubic yards of material would be excavated from the channel using a sealed clamshell dredge. Approximately 15,400 square feet (920 linear feet) of the slope of the existing levee near the gate would be protected with riprap.

The northern permanent storage area would consist of a 25-foot-wide-by-50-foot-long area (1,250 square feet) enclosed by an access control gate and fence. Within the storage area would be an emergency generator, fuel tank, and radio antenna to be used for telemetered data communication. Construction would last up to 30 months, from April 2006 through November 2008, with a maximum crew of about 100 people.

2.3.2 Gate Operations

2.3.2.1 Adaptive Management of South Delta Gate Operations

The permanent operable gates that will be constructed in the south Delta will be operated within an adaptive management framework so that the various benefits from these gate operations can be maximized. The gates can be opened or closed at any time in response to the local tidal level and tidal flow conditions within the south Delta. In this regard they are very different from the temporary barriers that have been installed for the past several years.

Because these operable gates are designed as "lift gates" that are hinged at the bottom of the channel, "closure" of the gates can be specified at any tidal level, leaving a weir opening for some tidal flow over the gate. The ability to operate the tidal gates with any specified weir crest elevation (i.e., top of the gates) provides a great deal of flexibility. The top elevation of each individual gate can be slightly different (i.e., steps) to provide less weir flow as the tidal level declines. The top elevation of the gates can also be slowly raised or lowered to adjust the tidal level and/or tidal flow in response to local south Delta conditions.

South Delta Gates

The proposed management of south Delta tidal level and tidal flow conditions involves the use of five gates:

- CCF intake tidal gate (existing),
- Grant Line Canal (at western end) flow control gate,
- Old River at DMC flow control gate,
- Middle River flow control gate, and
- head of Old River fish control gate.

The CCF intake gate already exists and has been used since SWP Banks began operations in 1972 to control flows from Old River and maintain the water level inside of CCF.

These five gates in the south Delta would be operated to accomplish the following purposes:

1. Maintain a relatively high water level within the CCF to allow SWP Banks to maximize pumping during the off-peak (nighttime) hours. The CCF level cannot be allowed to fall below –2 feet msl because of cavitation concerns at the SWP Banks pumps. The CCF gates are closed when the outside tidal level in Old River drops below the CCF level (to avoid outflow from CCF).
2. Control the inflow to CCF to remain less than the design flow of about 15,000 cfs to prevent excessive erosion of the entrance channel. The CCF gates are partially closed when the difference between the CCF level and Old River tidal level is more than 1.0 foot to avoid inflow velocities of greater than 10 feet/sec.
3. Maintain the high-tide conditions in the south Delta by not diverting into CCF during the flood-tide period that precedes the higher-high tide each day. The CCF intake gates are closed for about 6 hours each day to preserve the high-tide level in Old River to supply sufficient water for Tom Paine Slough siphons. This CCF tidal gate operation is referred to as priority 3 by DWR.
4. Control the minimum tidal level elevation upstream of the gates to be greater than a selected target elevation (i.e., 0.0 feet msl). The gates can be closed (raised) to a specified top elevation (e.g., 0.0 feet msl) as the upstream tidal level declines during ebb tide.
5. Control the tidal flushing upstream of the gates with relatively low-salinity water from Old River and Middle River downstream of the gates (i.e., high fraction of Sacramento River water). The gates would remain fully open during periods of flood tide (i.e., upstream flow) and then be fully closed (i.e., top elevation of gates above upstream water surface) during periods of ebb tide (i.e., downstream flow). One of the gates (i.e., Grant Line) must be maintained at a lower elevation (i.e., 0.0 feet msl) to allow the ebb tide flow to exit from the south Delta channels so that the flood-tide flow over the gates can be maximized during each tidal cycle. A water surface elevation upstream of the gates that is higher than 0.0 feet msl will reduce the cumulative flood-tide flows and reduce tidal flushing upstream of the gates.
6. Control the San Joaquin River flow diversion into Old River. This could increase the flow past Stockton and raise the low DO concentrations in the DWSC. Reduced flow to Old River might also reduce salinity in the south Delta channels by limiting the volume of relatively high-salinity water from the San Joaquin River that enters the south Delta channels. The head of Old River temporary barrier has been installed in October and November of many years to improve flow and DO conditions in the DWSC for up-migrating Chinook salmon. In recent years the barrier has also been installed during the outmigration period of April and May to reduce the percentage of

Chinook salmon smolts that are diverted into Old River and toward the CVP and SWP pumping plants.

Operation of the gates to accomplish the SDIP purposes without significant environmental impacts to water quality, tidal flows, or fish habitat conditions will require an accurate understanding of the effects of these gates.

The proposed gate operations will increase the tidal circulation in the south Delta channels. Gate operations to promote circulation would raise the Old River at Tracy and Middle River gates at each high tide to produce a circulation of water in the south Delta channels down Grant Line Canal. The Old River at Tracy and Middle River gates remain raised (closed) until the next flood-tide period when the downstream level is above the upstream water level. These gates are then lowered (opened) to allow flood-tide (upstream) flows across the gates. Gate operations to promote circulation uses a Grant Line gate weir crest at -0.5 feet msl during most periods of ebb tide (downstream flow) to protect the minimum level elevation of 0.0 feet msl. All gates are lowered (i.e., opened) during flood-tide periods as soon as the downstream tidal level is above the upstream water level.

2.3.2.2 Gate Operations Review Team

A federal and state interagency team will be convened to discuss constraints and provide input to the existing Data Assessment Team (DAT). The Gate Operations Review Team will make recommendations for the operations of the fish control and flow control gates to minimize impacts of resident threatened and endangered species and to meet water level and water quality requirements of south Delta water users. The interagency team will include representatives of DWR, Reclamation, USFWS, NOAA Fisheries, and DFG, and possibly others as needs change. The interagency team will meet through a conference call, approximately once a week. DWR will be responsible for providing predictive modeling, and SWP will provide operations forecasts and the conference call line. Reclamation will be responsible for providing CVP operations forecasts, including San Joaquin River flow, and data on current water quality conditions. Other members will provide the team with the latest information related to south Delta fish species and conditions for crop irrigation.

2.3.2.3 Head of Old River Fish Control Gate Operations

The operation (or closing) of the head of Old River fish control gate is intended to benefit the San Joaquin River watershed Central Valley fall-/late fall–run Chinook salmon by reducing the downstream movement of the salmon into the south Delta channels via Old River. Because the gate is functional, operations can be more flexible in response to the detection of fish presence and/or water quality. The operation of the head of Old River fish control gate for fish

protection and during other times of the year would lower the electrical conductivity (EC) of the western portion of these channels. This gate can have the largest effect on south Delta salinity. The salinity in the south Delta channels can be reduced to approach the EC of the SWP exports if the San Joaquin River diversion flow into the head of Old River is reduced.

Spring Operations/Vernalis Adaptive Management Plan

Operation (closing) of the head of Old River fish control gate is proposed to begin on April 1. Spring operation may continue through May 31, to protect outmigrating salmon and steelhead. During this time, the head of Old River gate would be fully closed, unless the GORT recommends a partial opening for other purposes.

If, in the opinion of the USFWS, NOAA Fisheries, and DFG, the gate needs to be operated at a different time or for a longer period to protect fish, it may be operated provided the following criteria are met:

- it is estimated that such operation would not increase take of other species (i.e., delta smelt) in excess of the take authorized by the original proposed operation;
- outmigrating salmon, steelhead, or other species (i.e., splittail) are present; and
- SDWA agricultural diverters are able to divert water of adequate quality and quantity.

Summer and Fall Operations

During June 1 through November 30, the gate would be operated to improve flow in the San Joaquin River, thus assisting in avoiding historically present low dissolved oxygen conditions in the lower San Joaquin River near Stockton. During this period, partial operation of the gate (partial closure to allow approximately 500 cfs of San Joaquin River flow into Old River) may be warranted to protect water levels in the South Delta channels. Gate operations during this period would be under review of the GORT. Operations during the months of October and November to improve flow and water quality conditions (i.e., low dissolved oxygen) for adult migrating Chinook salmon is expected to provide a benefit similar to that achieved with the temporary barrier. Operations would not occur if the San Joaquin River flow at Vernalis is greater than 5,000 cfs because it is expected that this flow would maintain sufficient DO in the San Joaquin River.

The exact timing and closure (i.e., partial opening) of both the fall and spring operations could be modified annually, in coordination with Gate Operations Review Team. Operations may also be modified in response to varying

conditions to avoid impacts on other species (i.e., delta smelt). During non-operational times of the year, the gates would remain fully lowered (open).

2.3.2.4 Flow Control Gates

The three flow control gates, Middle River, Grant Line Canal, and Old River near the DMC, would be operated (closed during some portion of the tidal cycle) throughout the agricultural season of April—September and on an as-needed basis during the rest of the year to protect water quality and levels.

Summer and Fall Operations

During April 1 through September 30, the gates would be operated to control minimum water levels and increase water circulation to improve water quality in the south Delta channels. Reclamation and DWR have committed to maintaining water levels during these times at 0.0 foot msl in Old River near the CVP Tracy facility, 0.0 foot msl at the west end of Grant Line Canal, and 0.5 foot msl in Middle River at Mowry Bridge. It is anticipated that the target level in Middle River would be lowered to 0.0 foot msl following extension of some agricultural diversions. The extension of agricultural diversions in the south Delta that are currently shallower than –2 feet msl (1929 NGVD) may also reduce the need to operate gates for water level control.

The proposed gate operations will increase the tidal circulation in the south Delta channels. Gate operations to promote circulation would raise the Old River at Tracy and Middle River gates at each high tide to produce a circulation of water in the south Delta channels down Grant Line Canal. Gate operations to promote circulation uses a Grant Line gate weir crest at -0.5 feet msl during most periods of ebb tide (downstream flow) to protect the minimum level elevation of 0.0 feet msl. All three gates are lowered (i.e., opened) during flood-tide (upstream flow) periods as soon as the downstream tidal level is above the upstream water level. Actual gate operations would likely vary from this general circulation plan and would be discussed on a weekly basis by the Gate Operations Review Team.

Proposed flow control gate operations would involve forecasting of water levels and potential changes in water quality in south Delta channels and operating the gates to maintain the agreed-upon water levels and water quality objectives. Forecasting would be performed on a frequent basis using the Delta Simulation Model 2 (DSM2), using forecasted tides, and proposed diversion rates of the projects to prepare operating schedules for the existing CCF gates and the four proposed operable gates.

Winter Operations

For the period from December through March, the Middle River, Grant Line Canal, and Old River near the DMC gates may be operated only with permission from USFWS, NOAA Fisheries, and DFG if they determine that any impacts associated with gate operation during this period would not result in additional impacts on threatened and endangered species beyond the scope of impacts analyzed in issuing BOs and take permits for gate operations.

2.3.3 Dredging

2.3.3.1 Gate Dredging

As described above under the gate design and construction detail section, dredging in the footprint of the gate would be necessary to clear the channel bottom for gate placement. Up to 150 feet upstream and 350 feet downstream from each gate site would be dredged using a sealed clamshell, as described below, to clear the area for construction and placement of the gate. The dredging of the upstream and downstream areas would avoid sensitive habitats, such as tidal emergent wetlands and riparian areas. This avoidance measure is described in detail in the Conservation Measures section below. Dredging would occur between August 1 and November 30, lasting approximately 15 days at each gate site. A 50,000-square-foot area would be purchased adjacent to each gate site and would be used as a runoff management basin for both initial dredging and maintenance dredging (described below).

Sealed Clamshell Dredging

Sealed clamshell dredging could occur from either a barge in the river channel or from the top of a levee, depending on restrictions caused by vegetation on channel banks or the width of a channel. If the dredging occurs from a barge, a small tugboat would be needed to maneuver the barge in the channel because sealed clamshell dredge barges are not self-propelling. From a barge, the operation would begin when the bucket assembly, attached by a boom (up to 100 feet long) is lowered into the channel to collect sediments. It would scoop up to 5 cubic yards of water-sediment slurry and deposit the dredged material into either a runoff management basin constructed on the landside of the levee adjacent to the channel or onto a barge that would move it to a runoff management basin in a different location.

If the dredging occurs from the levee, the sealed clamshell dredge would sit atop the levee and scoop up to 5 cubic yards of water-sediment slurry from the channel bottom, using the same method as from a barge, and deposit the dredged material into a runoff management basin.

A runoff management basin is typically rectangular and uses the levee as one of its walls. The remaining three walls are constructed of compacted local soil. The three constructed walls would not exceed 6 feet in height. Runoff management basins would be necessary to contain the 50% moisture sediment slurry and prevent drainage into agricultural ditches and channels. The slurry would reach 25% moisture content in 2–6 weeks, depending on the climate and the thickness of the spread. Once the moisture content was approximately 25% or less, it may be used beneficially for levee reinforcement or for agricultural soil supplement.

Clamshell dredging is more cost efficient than the hydraulic method. However, it can cause greater disruption to benthic environments when the bucket scrapes layers of sediments from the channel bottom. Clamshell dredging would likely be used in situations where there is limited space for spoils ponds, the likelihood of major disruption to vegetation and other organisms in the channel bottom is minimal, the area to be dredged is small, there are no channel islands, or there are no issues concerning temporary turbidity and sedimentation in the water. Using a sealed clamshell bucket would reduce turbidity generated by this method.

2.3.3.2 Conveyance Dredging

In addition to the dredging required to construct the gates, portions of West Canal, Middle River, and Old River would be dredged to improve conveyance and the operation of private agricultural siphons and pumps (Figures 1-1 and 2-5 through 2-7). In total, up to approximately 250,000 cubic yards of material would be dredged and spoiled within the south Delta. Dredging would be conducted near the center of the channel to avoid tidal emergent wetlands and riparian habitat. Conveyance dredging would be conducted using a hydraulic dredge, as described below. Conveyance dredging in Middle River, West Canal, and Old River to the east of the CVP intake would occur between August 1 and November 30 to minimize impacts on delta smelt and juvenile salmonids.

Dredge spoils will be temporarily stored in the spoils ponds (Figures 2-8 through 2-10) and later disposed of in the spoils disposal areas. Spoils disposal areas will consist of existing agricultural lands in the study area.

Hydraulic Dredging

The hydraulic dredging method siphons a water-sediment slurry (four parts water for every one part sediment) from the bottom of a channel and deposits it into a spoils pond to dry. Hydraulic dredging is used in situations where large areas are to be dredged, the concern for induced turbidity and harm to benthic vegetation is great, and ample area is available for spoils ponds. This dredging method is relatively expensive but does not cause excessive turbidity in the channel and causes only minimal disruption to vegetation and other benthic organisms outside the dredge area. It also allows options in disposal sites because flexible piping may be extended inexpensively from the dredge site to the spoils pond, which may be some distance away.

Because of the difficulty involved with starting and stopping the dredge equipment, hydraulic dredges are generally in operation 24 hours a day, 7 days a week, until dredging is complete. A pipe is lowered from a dredging barge in the channel into the bottom sediment. The pipe is used to siphon the sediment-water slurry into a flexible pipe that may be effectively extended up to 3,000 feet up or down the channel. This pipe may be weighted down to avoid interfering with boat navigation near the project site. The flexible pipe is attached to a semipermanent, stationary pipe that is braced to the waterside of the levee and extends across the top and down the landside of the levee into the primary basin of a spoils pond. The flexible pipe would allow the barge to move relatively far from the stationary pipe, allowing more dredged area per spoils pond (Figures 2-9 and 2-10). The stationary pipe would range from 8 to 18 inches in diameter and would require that gravel be placed on either side to create a ramp over the pipe for vehicles and agricultural equipment. The direct deposition of the material into spoils ponds on adjacent lands allows uninterrupted dredging up to the capacity of the spoils pond. Up to 5,000 cubic yards of material may also be transported to spoils ponds by barges. The spoils ponds would be constructed on the landside of the levee adjacent to the channels, and would be used for the decanting process, effectively separating the sediment from the water and allowing dried material to be put to beneficial use. The ponds would be constructed of local compacted soils to avoid toxicity and erosion of their sides.

Spoils ponds are typically made up of three basins: primary, secondary, and return basins. The primary and secondary basins serve to settle sediments out of the dredged slurry. When water reaches the return basin, most suspended sediment has settled out of it, and the water is then pumped back into the channel from which it was taken; the discharge is subject to U.S. Army Corps of Engineers (Corps) and Regional Water Quality Control Board (RWQCB) discharge requirements (Figures 2-9 and 2-10). The sediment would take between 24 and 36 days to settle out of the water. A single spoils pond that is 3,600 feet long, 1,600 feet wide, and 6 feet high can hold up to 284,444 cubic yards of the water-sediment slurry if the pond is filled up to 4 feet with dredged material. However, the largest spoils pond would be up to 80 acres. The absolute capacity of a single pond would be determined by the size of the pond, the rate at which the sediments settle, the rate at which the water is pumped from the return basin, and the rate of dredging. As water moves from the primary to the secondary basins, more area becomes available for additional dredged material. The pond is then reused or left to dry. Dried material could be used as levee reinforcement or as soil supplement to surrounding agricultural lands.

Approximately 5% of all the spoils would be used for levee reinforcement. The semi-dry material would be placed approximately 1 foot deep on the landside of existing levees. This would cover any holes or cracks and would therefore improve the stability of the levee system in the south Delta. To avoid any impacts on sensitive vegetation and wildlife, areas of levees with vegetation would not be reinforced. All applicable permits would be secured prior to levee reinforcement to ensure compliance with the CWA and other pertinent regulations. The other 95% of the material would be spread over agricultural

land at an approximate depth of 1 foot and could improve the quality of the existing soil.

Table 2-2 shows a summary of the proposed conveyance dredging activities. A more detailed discussion of each proposed dredge area and spoils placement is presented below.

Middle River

Middle River would be dredged from the head of Middle River (at Old River) to approximately 5.3 miles west (Figures 1-1 and 2-6) to an elevation of –8 feet msl to accommodate agricultural siphons and pumps. Dredging would be done hydraulically from a barge. Approximately 200,000 cubic yards of material would be dredged and dried at one or more drying areas on Union Island, Roberts Islands, or Stewarts Tract over a period of 4 years (Figure 2-1). It is estimated that the dredged material would occupy a total area of approximately 165 acres for spoiling ponds, assuming they can be reused during each dredging phase. Dredging estimates are based on a dredging efficiency of 20% solids removal commonly achieved by hydraulic dredging. The dredged material would be dried to a moisture content of approximately 25% and then could be reshaped to reinforce the existing levees or used for other beneficial agricultural uses in the project vicinity.

West Canal

West Canal is a major artery carrying water to the SWP and CVP. When exports are high and San Joaquin River flow is low, the velocities in the channel become high enough to cause scouring and erosion of the channel bottom. Data collected from a DWR scour monitoring project for two locations in West Canal indicate erosion of approximately 5 feet of channel bottom within 4 years (reference 1997 to 2001). To reduce the velocities that cause scouring, West Canal would be enlarged by hydraulic dredging 3 feet from the channel bottom from the CCF intake north to the point where Victoria Canal meets West Canal (Figure 2-1). Up to 40,000 cubic yards of material would be removed over a period of 4 years. Dredged spoils would be dried in spoils ponds at Widdows Island (Figures 1-1 and 2-5). Dredging would require an area of approximately 40 acres for spoils ponds, assuming they can be reused during each annual dredging phase. No more than one pond would be necessary to spoil all the dredged water-sediment slurry. Dredging estimates are based on a dredging efficiency of 20% solids removal commonly achieved by hydraulic dredging. After water has been pumped from the return basin, the material would be dried to a moisture content of approximately 25%, and the dried sediment then could be reshaped to reinforce the existing levees or could be used for other beneficial agricultural uses in the project vicinity.

Old River

Several agricultural siphons and pumps on the Old River provide water for agriculture in the south Delta. Near the area where Old River, Paradise Cut, and Tom Paine Slough meet, sedimentation has accumulated near these siphons and pumps and is affecting the ability of these diversion facilities to provide water for agricultural uses. Dredging in this area would be conducted to improve siphon and pump operation. Up to 10,000 cubic yards of dredged material would be removed from the channel for conveyance purposes and placed in spoils ponds used for Middle River dredging to dry to a moisture content of approximately 25%. Spoils would be dried on Stewarts Tract (Figures 1-1 and 2-7). It is estimated that all of the dredged material would occupy an area of less than 10 acres. Estimates are based on a dredging efficiency of 20% solids removal commonly achieved by hydraulic dredging. After drying, spoils would be used to reinforce levees in the south Delta and/or for other beneficial agricultural uses in the project vicinity.

Table 2-2. Dredging Detail

Channel	Amount of Dredge (cubic yards)	Number of Dredging Operations	Maximum Dredge Amount per Day[1] (cubic yards)
Middle River	200,000	1	7,200
West Canal	40,000	1	7,200
Old River	10,000	1	7,200
Total	**250,000**	**3**	**21,600**

Note: The maximum dredge amount per day is based on the assumption that 300 cubic yards of spoils will be generated every hour and that dredging will be performed 24 hours per day.

2.4 Environmental Commitments

2.4.1 Conservation Measures

Conservation measures are measures that will be implemented to avoid, minimize, and mitigate adverse impacts on fish, wildlife, and plant species and natural communities. The conservation measures identified in this ASIP tier from the programmatic-level conservation measures identified in the MSCS and were developed in coordination with ASIP team representatives from USFWS, NOAA Fisheries, and DFG. Additionally, conservation measures are consistent with the CALFED Programmatic EIR and the SDIP EIS/EIR.

Initially, MSCS programmatic conservation measures for each ASIP-covered species and natural community were reviewed, and project-level conservation

measures were developed from those MSCS conservation measures that were applicable to the project. In some instances, additional conservation measures were developed to adequately avoid, minimize, and compensate for impacts on ASIP-covered plant and wildlife species and natural communities.

Conservation measures to avoid, minimize, and compensate for impacts of implementing the SDIP on ASIP-covered species and natural communities are identified in Tables 2-3 and 2-4. The avoidance and minimization measures are summarized in Table 2-3. The compensation and mitigation measures, including the compensation/mitigation ratios and acreages, are summarized in Table 2-4. All of these measures are fully described in Chapters 4 and 5.

Environmental enhancements are summarized below and in Table 2-5.

2.4.1.1 Avoidance and Minimization

Avoidance and minimization measures are those project actions that will be implemented to avoid and minimize project-related impacts on ASIP-covered species and natural communities. These measures may include, but are not limited to, preconstruction surveys, avoiding occupied habitats, minimizing impacts on natural communities, installing protective fencing, and providing an on-site biological monitor. Table 2-3 summarizes the avoidance and minimization measures for covered species and natural communities.

2.4.1.2 Compensation/Mitigation

Compensation and mitigation measures are those project actions that will be implemented to reduce or compensate for direct and indirect impacts on ASIP-covered species and natural communities. These actions include measures to reduce the project impacts on covered species and natural communities and to compensate for the loss of covered species and natural communities. Table 2-4 summarizes the compensation and mitigation measures and the compensation and mitigation ratios and acreages for covered species and natural communities.

2.4.1.3 Environmental Enhancements

Environmental enhancements are those actions that are not required to compensate for/mitigate impacts on ASIP-covered species or natural communities but that will be implemented by DWR to provide a benefit to ASIP-covered species and natural communities within and/or outside the study area. Covered species and natural communities occurring outside the study area will not be affected by gate construction or channel dredging; however, the enhancements will be implemented to benefit ASIP-covered species and natural communities.

Table 2-3. Avoidance and Minimization Measures for ASIP-Covered Species and Natural Communities

Applicable Covered Species or Natural Community	Impact	Mitigation Measures to Avoid and Minimize Impacts	Description of Mitigation Measure[1]
Federally Listed Species (USFWS responsibility)			
San Joaquin kit fox	Loss or disturbance of San Joaquin kit fox or suitable habitat as a result of gate construction and channel dredging	SJKF1—Conduct preconstruction surveys for San Joaquin kit fox	Preconstruction surveys for kit fox will be conducted at and adjacent to all locations to be disturbed by construction and channel dredging activities to ensure that this species is not denning in these locations. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Preconstruction surveys will consist of surveying all potential denning habitat in the vicinity of proposed construction features, channel dredging areas, and mitigation sites, as well as along all haul roads located on levees. Surveys will be performed according to USFWS guidelines. Surveys will include walking transects (at least one survey to occur between May 1 and September 30), spotlighting surveys for 10 nights over a 15-day period, camera stations, and scent stations. The survey methods will be determined in coordination with USFWS.
		SJKF2—Minimize construction-related disturbances near active den sites	Major construction and dredging activities that will result in the greatest disturbance to a den site, as defined by the USFWS, will be deferred until after or as late in the breeding season as possible. If den sites are observed, DWR and Reclamation will provide the locations of active den sites identified during the preconstruction surveys to USFWS and will implement exclusion zones around kit fox dens, as described in USFWS recommendations for protection of the kit fox.
Giant garter snake	Loss of giant garter snake or suitable habitat for giant garter snake as a result of gate construction and channel dredging	GGSN1—Conduct preconstruction surveys for giant garter snake	Preconstruction surveys for giant garter snake will be conducted in all suitable breeding and foraging habitat in the vicinity of project or mitigation activities to ensure that this species is not present in these locations. Surveys will be performed by a USFWS-approved biologist. Surveys also will be performed at all mitigation sites prior to implementation of the mitigation features. Surveys will be performed during the species' active period (i.e., May 1–October 1). Preliminary surveys will include assessing the quality of the giant garter snake habitat in the affected areas. If it is determined that high-quality habitat will be affected, DWR and Reclamation will coordinate with USFWS to determine whether additional surveys are required. The survey results will be provided to USFWS before commencing construction activities.
		GGSN2—Minimize construction-related disturbances in the vicinity of occupied habitat	Portions of the gate construction and channel dredging activities will occur throughout the year and will overlap with the giant garter snake's active and inactive periods. To the greatest extent practicable, major construction activities that will affect giant garter snake breeding and foraging habitat will be avoided during the species' active period. However, if wetland impacts are unavoidable during the species' active period, these wetlands must be dewatered and remain dry for at least 15 consecutive days prior to excavating or filling dewatered habitats. If construction activities will be conducted during the species' inactive period, DWR and Reclamation will contact USFWS to determine whether additional measures are necessary to minimize and avoid take. Clearing of wetland vegetation will be confined to the minimal area necessary to complete the construction activities. The movement of heavy equipment will be restricted to established roadways or constructed haul roads to minimize habitat disturbance.
Delta smelt	Loss of delta smelt as a result of gate construction, gate operation, and channel dredging	DESM1—Implement environmental commitments	• Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland (see Table 2-4). • Construct gates and dredge channels during authorized work windows. • Implement best management practices as described in Chapter 2.
Valley elderberry longhorn beetle	Loss of valley elderberry longhorn beetle as a result of gate construction and channel dredging	VELB1—Perform a preconstruction and postconstruction survey for elderberry shrubs	Before the start of construction- and restoration-related activities, an on-site biologist will perform an elderberry shrub survey to ensure that any elderberry shrubs occurring in the vicinity of project components are identified. The on-site biologist will field stake the locations of elderberry shrubs and shrub clusters, if present, before construction begins (see Mitigation Measure VELB2). The surveys will be performed according to USFWS VELB compensation guidelines. During the preconstruction and postconstruction surveys, the following information will be recorded for each shrub or shrub cluster: • number of stems greater than 1 inch in diameter, • number of stems less than 1 inch in diameter, • approximate height and width of the elderberry shrub or shrub cluster, • presence of VELB exit holes, and • dominant vegetation associated with the elderberry shrub or shrub cluster. The location of each elderberry shrub will be mapped using GPS, and a site map will be prepared identifying the location and size of each shrub and shrub cluster. DWR and Reclamation will use this site map to determine vehicle and equipment haul routes and work areas. Following completion of dredging activities, DWR and Reclamation will perform a postconstruction evaluation of the elderberry shrubs to determine whether any shrubs were damaged by construction activities. If damage occurs to elderberry shrubs, DWR and Reclamation will consult with USFWS on appropriate mitigation.
		VELB2—Avoid and minimize impacts on elderberry shrubs	Wherever feasible, DWR and Reclamation will avoid and minimize impacts on elderberry shrubs. Avoidance and minimization efforts will be performed according to USFWS VELB compensation guidelines. If elderberry shrubs with one or more stems measuring 1 inch or greater in diameter at ground level or plants with visible evidence of exit holes are located within or adjacent to proposed construction or dredging areas, DWR and Reclamation will implement the following actions. Install exclusion fencing around each elderberry shrub and shrub cluster. • Avoid disturbance to VELB by establishing and maintaining, to the maximum extent feasible, a 100-foot buffer around elderberry plants identified as suitable habitat. If a 100-foot buffer cannot be maintained, DWR and Reclamation will consult and gain approval from USFWS for measures that would minimize disturbance and promptly restore the damaged area. • Fence and flag all buffer areas and place signs every 50 feet along the edge of the avoidance area, as described in the VELB compensation guidelines. • Train construction personnel to recognize elderberry shrubs and to determine the presence of VELB from exit holes on stems. All construction personnel should receive USFWS-approved environmental awareness training prior to undertaking work at construction sites.

Table 2-3. Continued

Applicable Covered Species or Natural Community	Impact	Mitigation Measures to Avoid and Minimize Impacts	Description of Mitigation Measure[1]
Federally Listed Species (NOAA Fisheries responsibility)			
Central Valley spring-run Chinook salmon Sacramento River winter-run Chinook salmon Central Valley steelhead	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	CHSA1—Implement environmental commitments	• Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland (see Table 2-4). • Construct gates and dredge channels during authorized work windows. • Implement best management practices as described in Chapter 2.
Green sturgeon	Loss of green sturgeon as a result of gate construction, gate operation, and channel dredging	GRST1—Implement environmental commitments	• Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland (see Table 2-4). • Construct gates and dredge channels during authorized work windows. • Implement best management practices as described in Chapter 2.
English sole and starry flounder (EFH species)—		None	
State Listed Species (DFG responsibility)			
California black rail	Loss or disturbance of California black rail or suitable nesting habitat as a result of gate construction and channel dredging	BLRA1—Conduct preconstruction surveys for California black rail	Preconstruction surveys for California black rail will be conducted at and adjacent to all locations to be disturbed by construction, channel dredging, and spoils deposition, to ensure that this species is not nesting in these locations. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Preconstruction surveys will consist of surveying all suitable breeding habitat in the vicinity of project or mitigation activities. Surveys will be performed to record species presence, density, and abundance. Surveys will be performed in all tule and cattail emergent wetlands that are greater than 1.2 acres (0.5 hectare) in area and have shallow water or moist soil conditions. Fixed, permanent survey points will be selected, marked in the field, and recorded using GPS. Surveys will be performed several times during the breeding season to avoid and minimize impacts on late-nesting birds. The surveys will be performed during periods of good weather. The survey points will be surveyed in either the early morning or evening. Morning surveys will begin within 30 minutes of sunrise and will be completed within 4 hours after sunrise. Evening surveys will begin 4 hours before sunset and be completed before dark. A recording of a black rail call will be played at varying intervals and responses will be noted. The playback interval will follow the guidelines identified in the black rail monitoring protocol. If a response is heard, the location will be marked on an aerial photograph, and the position will be recorded using GPS.
		BLRA2—Minimize construction-related disturbances in the vicinity of active nest sites	Gate construction and channel dredging will occur throughout the year and will overlap with the California black rail breeding season (i.e., mid-March–July). Major construction activities that occur in the vicinity of expected California black rail nest sites will be avoided during the breeding season. Construction or dredging activities that will result in the greatest disturbance to an active nest site will be deferred until after or as late in the breeding season as possible. DWR and Reclamation will provide the locations of active nest sites identified during the preconstruction surveys to DFG and will coordinate with DFG on appropriate avoidance and minimization measures on a case-by-case basis.
		BLRA3—Avoid removal of breeding habitat during the nesting season	As stated under Mitigation Measure BLRA1, preconstruction surveys will be performed to identify active nest sites before implementing construction, dredging, or mitigation activities. In locations where emergent wetland vegetation is scheduled for removal, DWR and Reclamation will remove suitable breeding habitat before the start of the nesting season. Additionally, before February 15 of each construction season, DWR and Reclamation will remove all suitable nesting habitat in areas where vegetation is scheduled to be cleared. Removal of vegetation before the nesting season will ensure that occupied nests are not removed. If construction, dredging, or mitigation activities require the removal of additional vegetation not previously designated for removal, DWR and Reclamation will perform clearance surveys to determine whether nesting rails are present. If additional vegetation removal is required, it will be deferred until after the breeding season, to the greatest extent practicable.
Swainson's hawk	Loss or disturbance of Swainson's hawk nests or foraging habitat as a result of gate construction and channel dredging	SWHA1—Conduct preconstruction surveys to locate Swainson's hawk nest sites	Preconstruction surveys for Swainson's hawk will be conducted at and adjacent to all locations to be disturbed by construction, channel dredging, and spoils deposition to ensure that this species is not nesting in these locations. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Preconstruction surveys will consist of surveying all potential nest sites within ½ mile of proposed construction features, channel dredging areas, and mitigation sites. Surveys will be performed several times during the breeding season to avoid and minimize impacts on late-nesting birds. Nest sites will be marked on an aerial photograph, and the position will be recorded using GPS. Preconstruction survey data will be used in accordance with Mitigation Measures SWHA2, SWHA3, and SWHA4 (see Table 2-4).

Table 2-3. Continued

Applicable Covered Species or Natural Community	Impact	Mitigation Measures to Avoid and Minimize Impacts	Description of Mitigation Measure[1]
		SWHA2-Minimize construction-related disturbances within ½ mile of active nest sites	Portions of the gate construction and channel dredging activities will occur throughout the year and will overlap with the Swainson's hawk breeding season. DWR and Reclamation will provide the locations of active nest sites identified during the preconstruction surveys to DFG and will coordinate with DFG on appropriate avoidance and minimization measures on a case-by-case basis. To the greatest extent practicable, major construction activities that will occur within ½ mile of an active Swainson's hawk nest will be avoided during the breeding season. If practicable, depending on project components and schedule, construction or dredging activities that will result in the greatest disturbance to an active nest site will be deferred until after or as late in the breeding season as possible. If construction or other project-related activities that may cause nest abandonment or forced fledging are necessary within the buffer zone, DWR and Reclamation will monitor the nest site. A qualified wildlife biologist will perform monitoring. The biological monitor will notify DFG if the nest or nestlings are abandoned and the nestlings are still alive and to determine the appropriate actions. DWR and Reclamation will fund the recovery and hacking (controlled release) of the nestlings. This mitigation measure was developed based on a DFG staff report for Swainson's hawk (Appendix E).
		SWHA3—Avoid removal of occupied nest sites	As stated under Mitigation Measure SWHA1, preconstruction surveys will be performed to identify active nest sites before implementing construction, dredging, or mitigation activities. DWR and Reclamation will remove suitable nest trees in locations where trees are scheduled for removal before the start of the nesting season. Additionally, before February 15 of each construction season, DWR and Reclamation will remove all suitable nesting habitat for migratory birds in areas where vegetation is scheduled to be cleared. Removal of vegetation before the nesting season will ensure that occupied nests are not removed. If construction, dredging, or mitigation activities require the removal of additional vegetation not previously designated for removal, DWR and Reclamation will perform clearance surveys to determine whether nesting hawks are present. If additional tree removal is required, it will be deferred until after the breeding season.
White-tailed kite	Loss or disturbance of raptor nest sites as a result of gate construction and channel dredging	WTKI1—Conduct preconstruction surveys to locate white-tailed kite nest sites	Preconstruction surveys for white-tailed kites will be conducted at and adjacent to all locations to be disturbed by construction, channel dredging, and spoils deposition to ensure that this species is not nesting in these locations. Surveys will also be performed at all mitigation sites prior to implementation of the mitigation features. Preconstruction surveys will consist of surveying all suitable nest sites within ¼ mile of proposed construction features, channel dredging areas, and mitigation sites. Surveys will be performed several times during the breeding season to avoid and minimize impacts on late-nesting birds. Nest sites will be marked on an aerial photograph, and the position will be recorded using GPS. Preconstruction survey data will be used in accordance with Mitigation Measures WTKI-2, WTKI-3 and WTKI-4 (see Table 2-4).
		WTKI2—Minimize construction-related disturbances within ¼ mile of active nest sites	Portions of the gate construction and channel dredging activities will occur throughout the year and will overlap with the white-tailed kite breeding season. To the greatest extent practicable, major construction activities that will occur within ¼ mile of an active white-tailed kite nest will be avoided during the breeding season. If practicable, construction or dredging activities that will result in the greatest disturbance to an active nest site will be deferred until after or as late in the breeding season as possible. DWR and Reclamation will provide the locations of active nest sites identified during the preconstruction surveys to DFG and will coordinate with DFG on appropriate avoidance and minimization measures on a case-by-case basis.
		WTKI3—Avoid removal of occupied nest sites	As stated under Mitigation Measure WTKI1, preconstruction surveys will be performed to identify active nest sites before implementing construction, dredging, or mitigation activities. DWR and Reclamation will remove suitable nest trees in locations where trees are scheduled for removal before the start of the nesting season. Additionally, before February 15 of each construction season, DWR and Reclamation will remove all suitable nesting habitat in areas where vegetation is scheduled to be cleared. Removal of vegetation before the nesting season will ensure that occupied nests are not removed. If construction, dredging, or mitigation activities require the removal of additional vegetation not previously designated for removal, DWR and Reclamation will perform clearance surveys to determine whether nesting kites are present. If nest sites are present, tree removal will be deferred until after the breeding season.
Delta smelt	Loss of delta smelt as a result of gate construction, gate operation, and channel dredging	See information above under "Federally Listed Species (USFWS responsibility)"	See information above under "Federally Listed Species (USFWS Responsibility)"
Central Valley spring-run Chinook salmon	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	See information above under "Federally Listed Species (NOAA Fisheries responsibility)"	See information above under "Federally Listed Species (NOAA Fisheries responsibility)"
Sacramento River winter-run Chinook salmon	Loss of salmonids as a result of gate construction, gate operation, and channel dredging	See information above under "Federally Listed Species (NOAA Fisheries responsibility)"	See information above under "Federally Listed Species (NOAA Fisheries responsibility)"
Delta coyote-thistle	Loss of delta coyote-thistle as a result of gate construction and channel dredging	DECT1—Conduct preconstruction surveys for special-status plants	Within 1 year prior to initiating gate construction or channel dredging, DWR and Reclamation will conduct special-status plant surveys of all proposed areas of disturbance. The purpose of these surveys will be to verify that the locations of special-status plants in the 2000–2001 surveys are extant, to identify any new special-status plant occurrences, and to cover any portions of the project area not previously identified. The extent of mitigation for direct or indirect impacts on special-status plants will be based on these survey results. Locations of special-status plants within proposed construction areas will be recorded using a GPS unit and staked in the field.
		DECT2—Avoid and minimize impacts on delta coyote-thistle	If any delta coyote-thistle plants are found during preconstruction and cannot be avoided by construction or dredging activities, the plants will be salvaged, and/or seed and propagation material will be collected from the affected individual plants prior to the onset of the activities. Salvaged plants or propagation material will be immediately transplanted to an area of suitable habitat that is restored or enhanced as part of the riparian habitat mitigation–related activities, as described in Mitigation Measure DECT3 (see Table 2-4).

Table 2-3. Continued

Applicable Covered Species or Natural Community	Impact	Mitigation Measures to Avoid and Minimize Impacts	Description of Mitigation Measure[1]
Mason's lilaeopsis	Loss of Mason's lilaeopsis stands and potential habitat as a result of gate construction, gate operation and channel dredging	MALI1—Conduct preconstruction surveys for covered plant species	Within 1 year prior to initiating gate construction or channel dredging, DWR and Reclamation will conduct covered plant species surveys. The purpose of these surveys will be to verify that the locations of covered plant species in the 2000–2001 surveys are extant, identify any new covered plant species occurrences, and cover any portions of the project area not previously identified. The extent of mitigation of direct loss of covered plant species will be based on these survey results. Locations of covered plant species within proposed construction areas will be recorded using a GPS unit and staked in the field.
		MALI2—Map tidal mudflat habitat in the project area	The survey will include mapping of tidal mudflat habitat within the project area, including the gate footprints and dredging areas. The survey will also include an evaluation of the habitat quality based on surrounding habitats (e.g., adjacent riprapped levee banks would lower the habitat quality, adjacent riparian vegetation would increase habitat quality). The extent of both Mason's lilaeopsis occupied habitat and unoccupied tidal mudflat habitat will be quantified for use in determining the amount of habitat mitigation required.
		MALI3—Avoid and minimize impacts on Mason's lilaeopsis	Any stands of Mason's lilaeopsis that can be avoided within the construction area will be fenced, including a buffer of 50 feet on all sides.
		MALI5—Monitor existing stands of Mason's lilaeopsis during the gate operations phase	During the gate operation phase, DWR and Reclamation will monitor the Mason's lilaeopsis populations identified in the surveys conducted for Mitigation Measures MALI1 and MALI2. The purpose of monitoring will be to determine whether changes in the tidal zone that occur as a result of gate operations result in any loss of Mason's lilaeopsis. As discussed in the "Gate Operation" section above, an approximately 1.0-foot lowering of the tidal elevation is predicted to occur in the area upstream of the gates. DWR and Reclamation will annually monitor the extent and condition of the Mason's lilaeopsis populations identified during preconstruction surveys within 0.5-mile upstream of the gates. The extent of Mason's lilaeopsis will be monitored, adapting the methods used for the Barker Slough transplanting project, as appropriate (California Department of Water Resources 1990). Monitoring will include measurement of cover of the Mason's lilaeopsis plants using large-sized quadrats or a transect method. Monitoring of the areas upstream of the gates will be conducted annually for a 5-year period after the gates are constructed (Section 4.5.2.2 SDIP Mitigation Measures, specifically Mitigation Measure TTEW3—Monitor Existing Stands of Tidal Emergent Wetland Vegetation During the Gate Operations Phase). If a decrease in the extent of Mason's lilaeopsis is observed after gate operation begins or anytime during the 5-year monitoring period, DWR and Reclamation will compensate for the loss of this vegetation by implementing Mitigation Measure MALI4.
Natural Communities			
Tidal perennial aquatic	Loss of tidal perennial aquatic habitat as a result of gate construction and channel dredging	TPAQ1—Avoid and minimize disturbance of tidal perennial aquatic habitat	To the extent possible, DWR and Reclamation will avoid and minimize impacts on the tidal perennial aquatic habitat by implementing the environmental commitments listed in Chapter 2.
Tule and cattail tidal emergent wetland	Loss of tule and cattail tidal emergent wetland habitat as a result of gate construction and channel dredging	TTEW1—Avoid and minimize disturbance of tule and cattail tidal emergent wetland habitat	To the extent possible, DWR and Reclamation will avoid and minimize impacts on the tule and cattail tidal emergent wetland habitat. DWR and Reclamation will include the following measures in the project construction conditions to minimize indirect impacts on sensitive natural communities, including the tule and cattail tidal emergent wetland, and on special-status plants. • DWR and Reclamation will provide a biologist/environmental monitor who will be responsible for monitoring implementation of the conditions in the state and federal permits (CWA Section 401, 402, and 404; ESA Section 7; Fish and Game Code Section 1601; project plans (SWPPP); and SDIP EIS/EIR mitigation measures). • The biologist/environmental monitor will determine the location of environmentally sensitive areas adjacent to each gate site and dredge area based on mapping of existing land cover types and special-status plant species. To avoid construction-phase disturbance to sensitive habitats immediately adjacent to the project area, the monitor will identify the boundaries of sensitive habitats and add a 50-foot buffer, where feasible, using orange construction barrier fencing. The fencing will be mapped on the project designs. Erosion control fencing will also be placed at the edges of construction where the construction activities are upslope of wetlands and channels to prevent washing of sediments off site. The ESA and erosion-control fencing will be installed before any construction activities begin and will be maintained throughout the construction period. • The biologist/environmental monitor will ensure the avoidance of all sensitive habitat areas, including patches of tule and cattail tidal emergent wetland in channels, during dredging operations. • DWR and Reclamation will provide a worker environmental training program for all construction personnel prior to the start of construction activities. The program will educate workers about special-status species, riparian habitats, and waters of the United States present on and adjacent to the site and also about the regulations and penalties for unmitigated impacts on these sensitive biological resources. • Landing on in-channel islands, anchoring boats and/or barges to these islands, and encroaching by construction personnel on the islands will be prohibited. The exception to this measure is at Grant Line Canal, where the utility lines will cross the island, and construction personnel will have to access the utility corridor during installation. Following construction at the gate sites, the construction contractor will remove all trash and construction debris and implement a revegetation plan for temporarily disturbed vegetation in the construction zones. The elements that should be included in the revegetation of these sites are described in Mitigation Measures TTEW-2.

Table 2-3. Continued

Applicable Covered Species or Natural Community	Impact	Mitigation Measures to Avoid and Minimize Impacts	Description of Mitigation Measure[1]
		TTEW3—Monitor Existing Stands of Tidal Emergent Wetland Vegetation During the Gate Operations Phase	DWR and Reclamation will monitor the extent of tidal emergent wetland vegetation during the gate operation phase of the project to determine if changes in the tidal zone that occur as a result of gate operations result in the loss of tidal emergent wetland vegetation. As stated in Section 5.5.2.1 "SDIP Gate Construction, Channel Dredging, and Gate Operation," gate operation will result in a shift in the tidal range of approximately 1.0-foot upstream of the Grant Line Canal gate. DWR and Reclamation will monitor the extent and condition of the existing tidal emergent wetland for a distance of 0.5 mile upstream of the Grant Line Canal gate for a 5-year period after the gate is constructed. The extent of tidal emergent wetland will be mapped on an aerial photograph and compared to the baseline mapping performed by DWR. If a decrease in tidal emergent wetland vegetation is observed DWR and Reclamation will compensate for the loss of this vegetation by implementing Mitigation Measure TTEW2.
Valley/foothill riparian community	Loss of valley foothill riparian habitat as a result of gate construction and channel dredging	VFRC1—Avoid and minimize disturbance of riparian habitat	To the extent possible, DWR and Reclamation will avoid and minimize impacts on riparian habitat. DWR and Reclamation will include the following measures in the project construction conditions to minimize indirect impacts on riparian habitat and on special-status plants that may occur in this community. • DWR and Reclamation will provide a biologist/environmental monitor who will be responsible for monitoring implementation of the conditions in the state and federal permits (CWA Section 401, 402, and 404; ESA Section 7; Fish and Game Code Section 1601; project plans (SWPPP); and SDIP EIS/EIR mitigation measures). • The biologist/environmental monitor will determine the location of environmentally sensitive areas adjacent to each gate site and dredge area based on mapping of existing land cover types and special-status plant species (Figures 2-1–2-7). To avoid construction-phase disturbance to sensitive habitats immediately adjacent to the project area, the monitor will identify the boundaries of sensitive habitats and add a 50-foot buffer, where feasible, using orange construction barrier fencing. The fencing will be mapped on the project designs. Erosion control fencing will also be placed at the edges of construction where the construction activities are upslope of wetlands and channels to prevent washing of sediments off site. The ESA and erosion-control fencing will be installed before any construction activities begin and will be maintained throughout the construction period. • The biologist/environmental monitor will ensure the avoidance of all sensitive habitat areas, including in-channel islands, during dredging operations. • DWR and Reclamation will provide a worker environmental training program for all construction personnel prior to the start of construction activities. The program will educate workers about special-status species and riparian habitats present on and adjacent to the site and also about the regulations and penalties for unmitigated impacts on these sensitive biological resources. • Landing on in-channel islands, anchoring boats and/or barges to these islands, and encroaching by construction personnel on the islands will be prohibited. The exception to this measure is at Grant Line Canal, where the utility lines will cross the island, and construction personnel will have to access the utility corridor during installation. • Where feasible, construction will avoid removal of woody vegetation by trimming vegetation to approximately 1 foot above ground level. Following construction at the gate sites, the construction contractor will remove all trash and construction debris and implement a revegetation plan for temporarily disturbed vegetation in the construction zones. The elements that should be included in the revegetation of these sites are described in Mitigation Measure VFCR-2.
Upland cropland	Loss of upland cropland habitat as a result of gate construction and channel dredging	UPCR1—Avoid and minimize disturbance of upland cropland habitat	To the extent possible, DWR and Reclamation will avoid and minimize impacts on upland cropland habitat.

CWA = Clean Water Act.
DFG = California Department of Fish and Game.
DWR = California Department of Water Resources.
EFH = essential fish habitat.
EIS/EIR = environmental impact statement/environmental impact report.
GPS = global positioning system.
SDIP = South Delta Improvements Program.
SWPPP = stormwater pollution prevention plan.
USFWS = U.S. Fish and Wildlife Service.
VELB = valley elderberry longhorn beetle.

[1] Additional information regarding mitigation measures is provided in Chapters 4 and 5.

Table 2-4. Compensation and Mitigation Measures for ASIP-Covered Species and Natural Communities and Species

Covered Species or Natural Community	Impact Mechanism	Mitigation Measure to Compensate for Habitat Impacts	Description of Mitigation Measure	Habitat Type Affected	Impact (acres)	Mitigation Ratio	Mitigation Acreage
Natural Communities							
Tidal perennial aquatic	Loss of tidal perennial aquatic habitat as a result of gate construction and channel dredging	TPAQ2—Compensate for Loss of Tidal Perennial Aquatic Habitat	DWR and Reclamation will compensate for the permanent loss of up to 0.88 acre of tidal perennial aquatic habitat caused by construction of the Middle River, Grant Line Canal, Old River at DMC, and head of Old River gates at a ratio of 3 acres for each acre affected, for a total of up to 2.64 acres. DWR and Reclamation would purchase the tidal perennial aquatic habitat as mitigation credits from an approved mitigation bank in the project vicinity. One potential site is the Kimball Island Mitigation Bank. This mitigation is consistent with the MSCS conservation measure for tidal perennial aquatic habitat to "restore or enhance 2 to 5 acres of additional in-kind habitat for every acre of affected habitat near where impacts on habitat are incurred" (CALFED Bay-Delta Program 2000a).	Tidal perennial aquatic	0.088	3:1	2.64
			No compensation will be required for the temporary disturbance of up to 298.97 acres of tidal perennial aquatic habitat caused by conveyance dredging and gate dredging. Although the water depth within the dredged tidal perennial aquatic zones will be deeper, there will be no loss of area associated with conveyance dredging, and the temporary affects on water quality will subside following completion of dredging activities. Potential mitigation areas include Decker Island or the west end of Franks Tract.	Tidal perennial aquatic	298.97	1:1	298.97
Tule and cattail tidal emergent wetland	Loss of tule and cattail tidal emergent wetland habitat as a result of gate construction and channel dredging	TTEW2—Compensate for loss of tule and cattail tidal emergent wetland habitat	DWR and Reclamation will compensate for the unavoidable permanent loss of tule and cattail tidal emergent wetland habitat caused by construction of the Old River at DMC gate by restoring or enhancing in-kind habitat at a ratio of 3 acres for each acre affected. Revegetation will be planned and implemented prior to the removal of existing tidal emergent wetland vegetation. The 0.24 acre of tidal perennial aquatic habitat would be purchased as mitigation credits from an authorized mitigation bank in the project vicinity.	Tule and cattail tidal emergent wetland	0.08	3:1	0.24
Valley/foothill riparian community	Loss of valley foothill riparian habitat as a result of gate construction and channel dredging	VFRC2—Compensate for Temporary and Permanent Loss of Riparian Habitat	DWR and Reclamation will compensate for the temporary loss of up to 0.06 acre of nonjurisdictional riparian habitat for dredge pipe placement in conveyance dredge areas, the permanent loss of less than 0.01 acre of nonjurisdictional willow scrub at the Old River at DMC gate, and the permanent loss of up to 0.20 acre of jurisdictional riparian vegetation at the Middle River, Grant Line Canal, and Old River at DMC gates. Compensation will include restoring or enhancing in-kind riparian habitat at a ratio of 3 acres for each acre affected. If temporary impacts are avoided during placement of stationary pipelines, the required mitigation will be less. The mitigation ratio will ensure long-term replacement of habitat functions and values. Revegetation will be planned and implemented prior to the removal of existing riparian vegetation. This mitigation is consistent with the MSCS conservation measure to "restore or enhance 2 to 5 acres of additional in-kind habitat for every acre of affected habitat near where impacts are incurred before implementing actions that could result in the loss or degradation of habitat". As much of the mitigation habitat as possible will be created onsite or near the project area. The Grant Line Canal gate impact will be mitigated by replanting the disturbed vegetation on the in-channel island. Site selection, however, will avoid areas where future dredging, improvements, or maintenance is likely. DWR and Reclamation will obtain site access through a conservation easement or fee title. To the extent practicable, mitigation sites will be located near ongoing and future ERP projects. In addition to the requirements of the MSCS conservation measures, DWR and Reclamation will prepare a revegetation plan and monitor the restoration or enhancement mitigation sites. The revegetation plan will be prepared by a qualified restoration ecologist and reviewed by the appropriate agencies. The revegetation plan will specify the planting stock appropriate for each riparian land cover type and each mitigation site, ensuring the use of genetic stock from the south Delta area. The plan will employ the most successful techniques available at the time of planting. Success criteria will be established as part of the plan. Plantings will be maintained for a minimum of 5 years, including weed removal, irrigation, and herbivory protection.	Riparian	0.27	3:1	0.81

Table 2-4. Continued

Covered Species or Natural Community	Impact Mechanism	Mitigation Measure to Compensate for Habitat Impacts	Description of Mitigation Measure	Habitat Type Affected	Impact (acres)	Mitigation Ratio	Mitigation Acreage
			DWR and Reclamation will monitor the plantings annually for 6 years, followed by monitoring in years 8 and 10 following initial mitigation implementation, to ensure that they have established successfully. DWR and Reclamation will submit annual monitoring reports of survival to the regulatory agencies issuing permits related to habitat impacts, including the DFG, Corps, and USFWS. Replanting will be necessary if success criteria are not being met. The riparian habitat mitigation will be considered successful when the number of sapling trees established meets the success criteria, the habitat no longer requires active management, and vegetation is arranged in groups that, when mature, replicate the area, natural structure, and species composition of similar riparian habitats in the region. Specific mitigation funding sources are not identified at this time, but funding will be required and could include contributions from Proposition 13 (Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act, 2000), Proposition 204 (SB 900) (Safe, Clean, Reliable Water Supply Act, 1996), and/or water contractor contributions.				
Upland cropland	Loss of upland cropland habitat as a result of gate construction and channel dredging	UPCR2—Compensate for Loss of Upland Cropland Habitat	To compensate for the temporary loss of upland cropland, DWR and Reclamation will restore the agricultural land to preproject conditions.	Upland cropland (temporary impacts)	102	1:1	102
			To compensate for the permanent loss of upland cropland habitat that is associated with evaluated species, DWR and Reclamation will replace forage values of converted agricultural lands before or when project impacts are incurred. The compensation measures for the loss of upland cropland are described below and in Chapter 5 for the applicable ASIP-covered species.	Upland cropland (permanent impacts)	7.55	1:1	7.55
Federally Listed Species (USFWS responsibility)							
San Joaquin kit fox	Loss of suitable habitat as a result of gate construction and channel dredging	SJKF3—Replace Lost Habitat	If it is determined that occupied habitat, as described in the USFWS guidelines, is present, DWR and Reclamation will implement one of the following actions, pending direction from the USFWS: • acquire, protect, and manage 1–3 acres of existing occupied habitat for each acre within the same area of occupied habitat affected by the project; • enhance or restore 1–3 acres of suitable habitat near affected areas for each acre of occupied habitat affected; or • pending approval of the USFWS, purchase mitigation or conservation bank credits at an approved bank. If no occupied habitat is present DWR and Reclamation will not be required to implement these actions. If occupied habitat is present, DWR and Reclamation will acquire, protect, or manage 3.2 acres of suitable kit fox habitat in the study area or, pending approval of the USFWS, purchase mitigation or conservation bank credits at an approved bank.DWR and Reclamation will implement BMPs to revegetate disturbed ruderal habitats and agricultural lands following completion of project implementation. Disturbed areas will be seeded with a seed mix consisting of noninvasive, native and naturalized grasses and forbs. Revegetation of disturbed areas will restore foraging habitat for the kit fox.	Ruderal	48	To be determined in consultation with the resource agencies following preconstruction surveys.	To be determined in consultation with the resource agencies following preconstruction surveys.
				Agricultural land	3.20	1:1	3.20
Giant garter snake	Loss of suitable habitat for giant garter snake as a result of gate construction and channel dredging	GGSN3—Replace Lost Habitat	If suitable giant garter snake habitat is identified during the preconstruction surveys, DWR and Reclamation will compensate for the unavoidable loss of giant garter snake habitat caused by construction of the gates and will also compensate for any additional acreage removed for dredging activities. This compensation will restore or enhance in-kind habitat at a ratio of 3 acres for each acre affected. Revegetation will be planned and implemented prior to the removal of existing tidal emergent wetland vegetation. Revegetation beyond the restoration of impacts associated with agricultural ditches and toe drains will include the restoration of tule and cattail tidal emergent wetland as described in the mitigation measures for tule and cattail tidal emergent wetland in Chapter 5 (Section 4.6.2.2, SDIP Mitigation Measures).	Agricultural ditches	tbd	To be determined in consultation with the resource agencies following preconstruction surveys.	To be determined in consultation with the resource agencies following preconstruction surveys.

Table 2-4. Continued

Covered Species or Natural Community	Impact Mechanism	Mitigation Measure to Compensate for Habitat Impacts	Description of Mitigation Measure	Habitat Type Affected	Impact (acres)	Mitigation Ratio	Mitigation Acreage
				Ruderal	48	To be determined in consultation with the resource agencies following preconstruction surveys.	To be determined in consultation with the resource agencies following preconstruction surveys.
				Agricultural land	109	To be determined in consultation with the resource agencies following preconstruction surveys.	To be determined in consultation with the resource agencies following preconstruction surveys.
Delta smelt	Loss of habitat as a result of gate construction and channel dredging	DESM2—Compensate for Loss of Habitat or Disturbance	Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland. DWR and Reclamation will compensate for the permanent loss of up to 0.88 acre of tidal perennial aquatic habitat caused by construction of the Middle River, Grant Line Canal, Old River at DMC, and head of Old River gates at a ratio of 3 acres for each acre affected, for a total of up to 2.64 acres. DWR and Reclamation would purchase the tidal perennial aquatic habitat as mitigation credits from an approved mitigation bank in the project vicinity. One potential site is the Kimball Island Mitigation Bank.	Tidal perennial aquatic (permanent impacts)	See information above under "Natural Communities"	–	–
			Temporary disturbance of tidal perennial aquatic habitat would occur during channel dredging. A total of 298.97 acres of tidal perennial aquatic habitat occurs in the gate site and conveyance dredging areas. However, impacts from dredging would be temporary and would affect primarily water quality. The actual dredged area footprint is expected to be less than 298.97 acres because not all of the tidal perennial aquatic habitat in these areas would be dredged. However, because the exact boundaries of dredging have not been identified, it is assumed that the entire area would be affected. No mitigation would be required for the temporary disturbance of tidal perennial aquatic habitat resulting from channel dredging because there would be no permanent loss of habitat area.	Tidal perennial aquatic (temporary impacts)	See information above under "Natural Communities"	–	–
			Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland.	Tule and cattail tidal emergent wetland	See information above under "Natural Communities"	–	–
Valley elderberry longhorn beetle	Loss of habitat as a result of gate construction and channel dredging	VELB3—Compensate for Unavoidable Impacts on Elderberry Shrubs	VELB habitat will be avoided; therefore there will be no loss of VELB habitat. This mitigation measure is provided in case unavoidable and unanticipated impacts occur during the construction phase. DWR will attempt to perform construction and dredging operations without affecting elderberry shrubs and to maintain a 100-foot buffer zone around all elderberry shrubs, to the greatest extent possible. However, if avoidance and minimization of impacts on VELB habitat are not possible, DWR and Reclamation will compensate for unavoidable impacts based on the VELB conservation guidelines (U.S. Fish and Wildlife Service 1999d). Mitigation efforts may include transplanting existing elderberry shrubs and planting additional elderberry and associated plant species at an on-site or off-site mitigation area or purchasing VELB mitigation credits at a USFWS-approved mitigation bank.	VELB habitat will be avoided. No mitigation required.	n/a	n/a	n/a

Table 2-4. Continued

Covered Species or Natural Community	Impact Mechanism	Mitigation Measure to Compensate for Habitat Impacts	Description of Mitigation Measure	Habitat Type Affected	Impact (acres)	Mitigation Ratio	Mitigation Acreage
Federally Listed Species (NOAA Fisheries responsibility)							
Central Valley spring-run Chinook salmon Sacramento River winter-run Chinook salmon Central Valley steelhead	Loss of salmonid habitat as a result of gate construction, gate operation, and channel dredging	Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland.	Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland.	Tidal perennial aquatic (permanent impacts)	See information above under "Natural Communities"	–	–
			Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland.	Tule and cattail tidal emergent wetland	See information above under "Natural Communities"	–	–
Green sturgeon	Loss of habitat as a result of gate construction, gate operation, and channel dredging	Compensate for loss on habitat or disturbance.	Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland.	Tidal perennial aquatic (permanent impacts)	See information above under "Natural Communities"	–	–
			Implement compensation and mitigation measures for tidal perennial aquatic and tule and cattail tidal emergent wetland.	Tule and cattail tidal emergent wetland	See information above under "Natural Communities"	–	–
State Listed Species (DFG responsibility)							
California black rail	Loss or disturbance of suitable nesting habitat as a result of gate construction and channel dredging	BLRA4—Replace Lost Breeding Habitat	DWR and Reclamation will compensate for the unavoidable loss of tule and cattail tidal emergent wetland habitat caused by construction of the gates and will also compensate for any additional acreage removed for dredging activities. This compensation will restore or enhance in-kind habitat at a ratio of 3 acres for each acre affected as described in the mitigation measures for tule and cattail tidal emergent wetland in Chapter 4 (Section 4.6.2.2, SDIP Mitigation Measures).	Tule and cattail tidal emergent wetland	See information above under "Natural Communities"	–	–
Swainson's hawk	Loss or disturbance of Swainson's hawk nests or foraging habitat as a result of gate construction and channel dredging	SWHA4—Replace Lost Foraging and Nesting Habitat	To compensate for the loss of foraging habitat, DWR and Reclamation will provide mitigation for the loss of Swainson's hawk foraging habitat, as required by DFG. Based on recorded nest site observations in the project area, it can be assumed that gate construction, channel dredging, and mitigation activities will occur within 1 mile of active nest sites. As a result, DWR and Reclamation will provide mitigation for foraging habitat at the following ratios obtained from the DFG staff report on Swainson's hawk mitigation (Appendix F)	Riparian woodland	See information above under "Natural Communities"	–	–

Table 2-4. Continued

Covered Species or Natural Community	Impact Mechanism	Mitigation Measure to Compensate for Habitat Impacts	Description of Mitigation Measure	Habitat Type Affected	Impact (acres)	Mitigation Ratio	Mitigation Acreage
			Provide 1 acre of suitable foraging habitat (e.g., HM lands) for each acre of affected habitat (1:1 ratio). At least 10% of these lands shall include a fee title acquisition or conservation easement that allows for active management of the land to manage for active prey production (i.e., land management that provides suitable foraging habitat for Swainson's hawk). The remaining 90% of the HM lands will be protected by a conservation easement on agricultural or other lands that provide suitable foraging habitat for Swainson's hawks. DWR and Reclamation will also provide for funding to ensure the long-term management of these managed lands by funding a site-management endowment at a rate to be determined by DFG. To compensate for the loss of nesting habitat, DWR and Reclamation will replace affected riparian vegetation as described in Chapter 4. As part of this mitigation, DWR and Reclamation will develop the revegetation plan to ensure that three replacement trees are planted for each tree that is affected, as required by DFG.	Agricultural land	109	To be determined in consultation with the resource agencies following preconstruction surveys.	To be determined in consultation with the resource agencies following preconstruction surveys.
White-tailed kite	Loss or disturbance of raptor nest sites as a result of gate construction and channel dredging	WTKI4—Replace Lost Breeding Habitat	DWR and Reclamation will compensate for the unavoidable loss of suitable nesting habitat in the project area by restoring or enhancing in-kind habitat. This compensation will restore or enhance in-kind habitat at a ratio of 3 acres for each acre affected, as described in the mitigation measures for riparian habitat in Chapter 4 (Section 4.7.2.2, SDIP Mitigation Measures).	Riparian woodland and scrub	See information above under "Natural Communities"	–	–
		WTKI5—Replace Lost Foraging Habitat	To the extent practicable, natural habitats and agricultural habitats adjacent to occupied nesting habitats will be restored or enhanced to create a buffer zone of natural habitat. This buffer zone would protect nesting pairs from adverse effects that could be associated with future changes in land use on nearby lands and provide foraging and nesting habitat suitable for the natural expansion of populations. DWR and Reclamation will compensate for the unavoidable loss of suitable foraging habitat in the project area by restoring or enhancing in-kind habitat. Implementation of Conservation Measure UPCR-2, Compensate for the Loss of Upland Cropland, will replace affected upland cropland that provides foraging habitat for white-tailed kite. DWR and Reclamation will compensate for the loss of ruderal vegetation that may provide suitable foraging habitat for white-tailed kites by implementing BMPs. BMPs relevant to ruderal vegetation will include reseeding disturbed areas following completion of construction activities. Ruderal habitat will be reseeded with a noninvasive native and naturalized grass and forb seed mix that will replace the habitat values lost as a result of construction activities.	Upland cropland Ruderal	See information above under "Natural Communities"	–	–
Delta smelt	Loss of habitat as a result of gate construction, gate operation, and channel dredging	See information above under "Federally Listed Species (USFWS responsibility)"	–	–	–	–	–
Central Valley spring-run Chinook salmon	Loss of habitat as a result of gate construction, gate operation, and channel dredging	See information above under "Federally Listed Species (NOAA Fisheries responsibility)"	–	–	–	–	–
Sacramento River winter-run Chinook salmon	Loss of habitat as a result of gate construction, gate operation, and channel dredging	See information above under "Federally Listed Species (NOAA Fisheries responsibility)"	–	–	–	–	–

Table 2-4. Continued

Covered Species or Natural Community	Impact Mechanism	Mitigation Measure to Compensate for Habitat Impacts	Description of Mitigation Measure	Habitat Type Affected	Impact (acres)	Mitigation Ratio	Mitigation Acreage
Delta coyote-thistle	Loss of delta coyote-thistle as a result gate construction and channel dredging	DECT3—Compensate for Loss of Occupied Habitat	If Delta coyote-thistle is present in the project area, DWR and Reclamation will implement mitigation for loss of riparian scrub and willow scrub, as described in Chapter 4 (Section 4.7.2.2, SDIP Mitigation Measures). Mitigation for Delta coyote-thistle will provide 2 acres of suitable habitat for each acre of impact on occupied habitat. If offsite mitigation sites are identified, mitigation will be implemented prior to the loss of occupied habitat, and salvaged plant material will be planted at the mitigation site. If onsite mitigation sites will be used, mitigation will be implemented as soon as practicable after completion of construction or dredging activities. If onsite mitigation sites are used, salvaged plant material will be stockpiled or propagated at a native plant nursery for later planting.	Riparian and willow scrub (created)	See information above under "Natural Communities"	–	–
			DWR and Reclamation will acquire and preserve 2 acres of occupied, unprotected Delta coyote-thistle habitat for each acre lost.	Riparian and willow scrub (acquire and preserve)	0.18	2:1	0.36
Mason's lilaeopsis	Loss of Mason's lilaeopsis stands and potential habitat as a result of gate construction, gate operation and channel dredging	MALI4— Compensate for Loss of Mason's Lilaeopsis	Mitigation for unavoidable loss of Mason's lilaeopsis will be initiated prior to construction and will be based on the preconstruction survey results. Compensation for loss of Mason's lilaeopsis caused by gate construction for the SDIP, therefore, will include creation of new tidal mudflat habitat at a ratio of 5–10 linear feet for each linear foot removed by the project. The level of habitat quality of the occupied habitat to be removed will be evaluated during the preconstruction survey required under MALI2. Low-quality mudflat habitat at the base of riprapped levee banks, for example, would be mitigated at a ratio of 1:5, while high-quality mudflat habitat adjacent to tule and cattail tidal emergent wetland and/or riparian vegetation would be mitigated at or near the 1:10 mitigation ratio. DWR and Reclamation will identify suitable habitat-creation sites that: • are located as close to the site of plant removal as possible; • will include areas with minimal boat wakes, shallow water, and slow water velocities; and • are not likely to be dredged or have other improvements constructed. Created habitat will include a suitable mudflat substrate at appropriate tidal elevations (approximately 0.5–2 feet NGVD) and with minimal disturbance from boat wakes, channel dredging, and levee maintenance. DWR and Reclamation will obtain mitigation site access through a conservation easement or fee title. To the extent practicable, mitigation sites will be located near ongoing or future ERP projects. If offsite mitigation sites are identified, mitigation will be implemented prior to the loss of occupied habitat, and salvaged plant material will be planted at the mitigation site. If onsite mitigation sites will be used, salvaged plant material will be stockpiled or propagated at a native plant nursery for later planting, and mitigation will be implemented as soon as practicable after completion of construction or dredging activities. If off-site mitigation is necessary, a location that does not currently support tidal flats should be selected. An area that currently supports minimal habitat value, such as the portion of Old River upstream of the proposed fish gate, would be desirable. If water is too deep at a potential mitigation site, dredged material could be used to construct a bench area as substrate for the tidal mud flat habitat. Prior to use, however, such material would be subject to analysis for the presence of contaminants, such as heavy metals. Excessively high levels of contaminants would prohibit the use of dredge materials for bench construction. This mitigation approach is also likely to require additional permitting under Sections 401 and 404 of the CWA for placement of fill within a water of the United States. As additional experimental compensation to the MSCS measure, DWR and Reclamation will prepare a transplanting plan for the lilaeopsis, adapting the methodology outlined in the monitoring plan for transplanting Mason's lilaeopsis in Barker Slough (California Department of Water Resources 1990). The plan will include a success criterion for the transplanted plants to achieve 80% survival at the end of a 10-year monitoring period and additional compensatory measures to implement if the survival rate is not achieved.	Tidal mudflat	Linear feet of occupied habitat	5 – 10:1	To be determined in consultation with the resource agencies following preconstruction surveys.

Table 2-4. Continued

Covered Species or Natural Community	Impact Mechanism	Mitigation Measure to Compensate for Habitat Impacts	Description of Mitigation Measure	Habitat Type Affected	Impact (acres)	Mitigation Ratio	Mitigation Acreage
			All unavoidable stands of Mason's lilaeopsis to be removed from the construction area will be salvaged and transplanted to a portion of the created suitable habitat. Areas of occupied habitat should also be considered for enhancement, if transplanting is possible without disturbance of the existing Mason's lilaeopsis plants. DWR and Reclamation will obtain site access through a conservation easement or fee title. DWR and Reclamation will maintain the transplant areas for 5 years, including replanting, removal of trash or debris washed onshore, and removal of nonnative species, if possible, without disturbing the Mason's lilaeopsis plants. DWR and Reclamation will monitor the transplanted plants for at least 10 years after transplanting, adapting the methods used for the Barker Slough transplanting, as appropriate (California Department of Water Resources 1990). Monitoring will include measurement of cover of the transplanted plants using large-sized quadrats or, preferably, a transect method. Monitoring will be conducted on a quarterly basis for 1 year, then annually for the next 3 years, and once every 2 years for an additional 6 years. DWR and Reclamation will prepare a report of each monitoring period's results for submittal to DFG. The reports will include the monitoring data as well as a discussion of any problems with the plants and the measures implemented or proposed to correct the problems. The reports will also indicate the annual precipitation and note the occurrence of drought conditions or above-normal flooding events. This information will assist in evaluating whether the transplanted plants have been able to tolerate more than just normal precipitation years. If the monitoring period has coincided with an extended period of drought or high precipitation, DFG may request additional monitoring to measure the response of transplants to a greater range of natural processes.				

BMPs = best management practices.
Corps = U.S. Army Corps of Engineers.
CWA = Clean Water Act.
DFG = California Department of Fish and Game.
DMC = Delta-Mendota Canal.
DWR = California Department of Water Resources.
ERP = Ecosystem Restoration Program.
HM = habitat management
MSCS = Multi-Species Conservation Strategy.
MSCS = multi-species conservation strategy.

NGVD = national geodetic vertical datum.
NOAA Fisheries = National Oceanic and Atmospheric Administration, National Marine Fisheries Service.
Reclamation = U.S. Department of the Interior, Bureau of Reclamation.
SDIP = South Delta Improvements Program.
USFWS = U.S. Fish and Wildlife Service.
VELB = valley elderberry longhorn beetle.

Table 2-5. SDIP-Ranked Studies Related to Delta Fisheries Monitoring and Research Studies

Item	Name	Conceptual Basis	Description	Duration	Annual Cost (approximate)
1A	Larval Fish Entrainment Monitoring	Current SWP/CVP operations entrain large numbers of larval fish, particularly in the months of Jan. through June. There is substantial evidence that these losses are having population-level effects on delta smelt and striped bass, but the losses are not measured or indexed. The proposed SDIP will potentially increase pumping during the January–March period, suggesting that near-real-time monitoring of larval fish entrainment will be required to manage and minimize this incremental impact of the SDIP.	Daily larval fish sampling from January through May using towed or stationary nets, or continuous samplers, at the CVP and SWP (CCF) intakes combined with near-real-time lab processing and reporting to the DAT and WOMPT.	Ongoing, seasonal	$350,000
1B	Annual Delta Larval Fish Survey	The results of larval fish entrainment monitoring (Item 1A) will be most useful for SWP/CVP operations management if accompanied by a larval fish survey of the upper estuary. The results of the survey will enable assessments of relative risk to populations and cohorts associated with observed distribution patterns and physical habitat conditions.	Weekly larval fish sampling by towed net at 30 to 50 stations located in Suisun Bay and the Delta.	Ongoing, seasonal	$750,000
2	Hydrodynamics Effects Assessment	Increased CVP/SWP exports and other actions under the SDIP will change the hydrodynamics of the estuary and its tributaries at biologically important times. River flows, channel velocities and residence times, head differentials at the CCF radial gates, radial gate operations, and CCF turnover rates are all potentially affected by the SDIP. These factors in turn affect the transport of small fish and the transport and production of fish food organisms.	Conduct base condition and proposed SDIP condition modeling of CVP/SWP operations to describe expected changes in key flow and facility operations parameters. Use operations modeling results to model hydrodynamic effects including particle transport and water residence time changes.	2 years	$100,000

Table 2-5. Continued

Item	Name	Conceptual Basis	Description	Duration	Annual Cost (approximate)
3	Food-Web Effects Assessment	Recent investigations indicate that individual juvenile fish growth rates have declined in the estuary from historical levels and that juvenile fish food is also less abundant. It has been asserted that this reduced food–reduced growth situation could be contributing to observed population declines and poor recovery. The proposed SDIP has the potential to directly reduce the density of fish food organisms and reduce fish food production through hydrodynamic effects (e.g., reduced water residence time).	Use existing IEP-EMP phytoplankton and zooplankton data, and other available data, to estimate the degree to which recent historical export levels have contributed to the reduction in Delta fish food production. Assess the incremental effects of the proposed SDIP on fish food production using hydrodynamics modeling to identify changes in Delta channel water residence times and the degree of particle loss from various regions of the Delta.	3 years	$200,000
4A	Estuarine Physical Habitat Assessment (Mapping)	The density and composition of the fish community in the upper estuary is substantially influenced by physical habitat conditions. Bottom topography, shoreline morphology and vegetation characteristics, and the extent and composition of shallow aquatic vegetation (SAV) are among the important factors influencing fish populations that could be affected by the SDIP.	Establish GIS-based database and maps with appropriate fish habitat overlays to document pre-SDIP habitat conditions in the upper estuary. Regularly update and report on habitat changes.	10 years	$150,000
4B	Estuarine Physical Habitat Assessment (Analysis)	There are clear and logical conceptual connections between CVP/SWP export operations and physical habitat conditions in the upper estuary. For example, alteration of salinity regimes should influence SAV type. However, comprehensive examination of these connections has not been pursued. Improved information regarding the relationships would allow the prediction of effects and allow assessment of the degree to which habitat changes in the future are fully, or in part, attributable to export operations.	Using the GIS-based habitat information developed initially under Item 8A, conduct analysis to identify associations between physical habitat conditions in the upper estuary. Apply those associations to predict habitat changes likely to occur from SDIP-related changes in water project operations.	3 years	$125,000

Table 2-5. Continued

Item	Name	Conceptual Basis	Description	Duration	Annual Cost (approximate)
5	Enhanced Sturgeon Investigations	Annual white sturgeon production is associated positively with the magnitude of winter and spring flows in the Sacramento River. However, there is not a detailed understanding of this relationship or the mechanisms underlying it. Effectively assessing and managing the impacts of the changes in streamflows resulting from the SDIP requires a more robust understanding of sturgeon responses to flow than is currently available.	Increase the tagging and recovery effort associated with IEP's adult sturgeon population estimation. Also, resume and enhance efforts to directly index annual spawning success and year-on-year abundance.	10 years	$100,000 (in addition to current IEP funding levels)
6	Enhance Basic Survey Indices	Increase the basic utility of the current larval fish surveys	Not available.	Ongoing	~$100,000 (in addition to current IEP funding levels)
7A	Fishery Loss Economic Impact Assessment	Increased direct and indirect losses of sport fishes associated with SDIP-related increases in CVP/SWP exports may reduce fishery stocks with coincident reductions in fishing opportunity and effort, and related angler expenditures.	Using accepted economic analysis methodologies, develop estimates of current fishery economic values and the incremental impact on these values of SDIP-related stock losses.	3 years	$100,000
7B	Fisheries Loss Mitigation Assessment	SDIP-related export increases are likely to have a negative impact on the estuary's striped bass population, primarily through increased entrainment loss. These losses can be measured, and appropriate levels of mitigation can implemented. Mitigation could take the form of net pen rearing of salvaged juvenile striped bass, or less direct forms such as contributions to fishing stamp funds or subsidization of license purchases by anglers.	Update and (on an ongoing basis) use population analysis and modeling to estimate the population-level effects of SDIP-related entrainment losses. Use the results of analyses and modeling to identify and appropriately size mitigation actions.	Ongoing	$100,000

Table 2-5. Continued

Item	Name	Conceptual Basis	Description	Duration	Annual Cost (approximate)
8A	Fish Facility Investigations (Release Site)	Post-release survival rates for salvaged fish are currently unknown for all species and life stages. The absence of this information inhibits the accurate estimation of current and anticipated CVP/SWP direct loss impacts, and the evaluation of the effectiveness of fish conservation and mitigation proposals.	Measure post-release fish survival through mark-recapture and/or mock release experiments under various ambient and/or designed conditions. Document predator dynamics and behavior at release sites.	5 years	$250,000
8B	Fish Facility Investigations (Salvage and Loss Estimate)	Fish loss estimates for fish entrained at the CVP and SWP export facilities are generally crude for the juvenile life stages of striped bass and salmon. For other species and life stages there is insufficient data.	Not available.	Not available	Not available
8C	Fish Facility Investigations (Efficiency Monitoring)	SDIP-related increases in export pumping are likely to negatively affect fish salvage efforts. Increased debris levels and increased numbers of fish in transport truckloads are two examples of how increased exports could strain salvage efforts and reduce efficiency. Enhanced monitoring of salvage conditions should be undertaken, so appropriate remedial actions can be made in a timely fashion. The dynamics of salvage efficiency relative to debris levels is not well understood	Conduct enhanced monitoring of salvage operations to quickly identify problem circumstances. Also, investigate the relationship between debris load levels and screening efficiency, possibly using experimental releases of juvenile fish under varying debris conditions.	Ongoing	$100,000
Total Annual Amount (approximate)				Years 1–2 = $2.4 million Years 2–3 = $2.2 million Years 3–5 = $1.8 million Years 6–10 = $1.6 million Years 11+ = $1.4 million	

CCF = Clifton Court Forebay.
CVP = Central Valley Project.
DAT = Delta Smelt Adaptive Management Team.
EMP = Environmental Monitoring Program.
GIS = geographic information system.
IEP = Interagency Ecological Program.
SDIP = South Delta Improvements Program.
SWP = State Water Project.
WOMPT = Watrer Operations Management Team.

The fish-control gate would reduce the straying of San Joaquin River fall-/late fall–run Chinook salmon into the south Delta, where they are susceptible to the CVP and SWP export facilities. There are no SDIP Stage 1 actions, however, that specifically contribute to the conservation or recovery of any ASIP-covered species or natural community. DWR, however, will implement several environmental enhancement measures that will contribute to recovery of covered species and natural communities. These projects will be developed and funded in coordination with the resources agencies and the CALFED Science Program and will be consistent with the Programmatic natural Determination for the CALFED Bay-Delta Program's MSCS. DWR has coordinated with DFG to identify the following environmental enhancement projects:

- purchase habitat on the Feather River to protect existing bank swallow habitats; and
- purchase land in the South Delta to create tidal, wetland, and riparian habitats.

In addition to these projects, DWR will fund new or ongoing surveys and investigations for fish species that may be affected by the SDIP (Table 2-5). DWR and DFG have agreed, in principal, to a funding limit of $6 million. DWR will coordinate with DFG to determine how the funds are allocated among the various surveys and investigations. Potential surveys and investigations are summarized in Table 2-5.

2.4.2 Best Management Practices

As part of the project planning process, DWR and Reclamation will incorporate certain environmental commitments and best management practices (BMPs) into the SDIP to avoid or minimize potential impacts and enhance the Delta environment. DWR, Reclamation, and the appropriate city and county agencies will also coordinate planning, engineering, and design phases of the project. Because the environmental commitments have been incorporated into the project by DWR and Reclamation, these commitments will not be restated in the impact analysis sections, but instead will be incorporated by reference.

2.4.2.1 Access Point/Staging Areas

DWR and Reclamation will establish staging areas for equipment storage and maintenance, construction materials, fuels, lubricants, solvents, and other possible contaminants in coordination with the resource agencies. Practices and procedures for construction activities along city and county streets will be consistent with the policies of the affected local jurisdiction.

Staging areas will have a stabilized entrance and exit and will be located at least 100 feet from bodies of water. If an off-road site is chosen, qualified biological and cultural resources personnel will survey the selected site to verify that no

sensitive resources would be disturbed by staging activities. If sensitive resources are found, an appropriate buffer zone will be staked and flagged to avoid impacts. If impacts on sensitive resources cannot be avoided, the site will not be used. Where possible, no equipment refueling or fuel storage will take place within 100 feet of a body of water. However, dredging equipment, specifically that located on the barge, would be refueled within the channel in accordance with the measures set forth in a stormwater pollution prevention plan (SWPPP) (as described below).

For areas where construction activities do not exist in the road right-of-way, biological and cultural resources personnel will determine whether the selected staging area meets the criteria identified in the preceding paragraph and whether additional environmental clearance is required for the site. If sensitive resources are identified on the site that cannot be protected by environmental commitments for similar resources, an alternate site will be selected.

2.4.2.2 Fish Passage During Construction

In-water work occurring between December 1 and July 31 would be confined within a cofferdam or silt curtain to prevent movement of fish into the construction area. During this time, flow around the cofferdam or silt curtain would be maintained to allow for fish passage. In-water work occurring between August 1 and November 30 would be from a barge and would not occupy substantial channel space. Therefore, fish passage will be maintained throughout construction of the operable gates.

2.4.2.3 Erosion and Sediment Control Plan

DWR and Reclamation will prepare and implement an erosion and sediment control plan to control short-term and long-term erosion and sedimentation impacts and to restore soils and vegetation in areas affected by construction activities. The plan will include all the necessary local jurisdiction requirements regarding erosion control and will implement BMPs for erosion and sediment control as required.

2.4.2.4 Stormwater Pollution Prevention Plan

A SWPPP will be developed by a qualified engineer or erosion control specialist and implemented prior to construction. The objectives of the SWPPP will be to (1) identify pollutant sources associated with construction activity that may affect the quality of stormwater, and (2) identify, construct, and implement measures to reduce pollutants in stormwater discharges during and after construction. DWR, Reclamation, and/or their contractor(s) will develop and implement a spill prevention and control program as part of the SWPPP to minimize impacts caused by spills of hazardous, toxic, or petroleum substances during construction

of the project. The program will be a component of the SWPPP, which will be completed before any construction activities begin. Implementation of this measure would comply with state and federal water quality regulations. The SWPPP will be kept on site during construction activity and will be made available upon request to representatives of the RWQCB. The SWPPP will include, but is not limited to, the following items:

- a description of potential pollutants to stormwater from erosion,
- management of dredged sediments and hazardous materials present on site during construction (including vehicle and equipment fuels), and
- details of how the sediment and erosion control practices comply with state and federal water quality regulations.

2.4.2.5 Dredging, Sampling and Analysis Plan, and Spoils Disposal

DWR and Reclamation, or their contractors, will ensure that dredging activities occur within the center channel and that no wetland, riparian, or other sensitive habitats are disturbed during, or as a result of, dredging activities. In addition, dredging would not affect or reduce intertidal habitats or channel islands within the dredge areas.

To ensure that potentially contaminated dredged materials do not affect surface water or groundwater resources, project proponents and/or their contractors will require a sampling and analysis plan (SAP) for proposed dredging areas no more than 1 year before proposed dredging activities. The SAP would be consistent with both EPA and RWQCB standards.

DWR and Reclamation will employ one or more geotechnical professionals with appropriate certifications to conduct testing on spoils materials excavated from the south Delta waterways for consistency with upland disposal and reuse, and for toxicity. The intensity and accuracy of testing will be conducted in accordance with commonly accepted standards. Results of the spoils testing, and subsequent plans for spoils disposal, will be provided to the Technical Advisory Panel responsible for the preparation of the Delta Dredge Reuse Strategy.

If the SAP indicates any layer of toxic materials above applicable standards, contractors will dredge so that either that layer is not disturbed or the entire layer is removed. This would effectively eliminate the potential for exposure of the benthic environment to toxic layers.

If the SAP concludes that dredged material is found to possess contaminants, its disposal may lead to significant impacts on groundwater quality by leaching contaminants into the underlying soil. However, the SAP would be followed by a suitability analysis in which a suitable environment for the disposal of contaminated soils would be chosen.

Once the spoils testing is completed and the results analyzed, one or more of three methods would be used to dispose of the spoils:

Untreated upland disposal and reuse. If the results of spoils tests indicate that the material is consistent with the composition and chemical properties of the proposed upland disposal areas, and would not result in a change in the soils' suitability for continuing use as farm or grazing land, project proponents would dispose of up to 294,000 cubic yards of decanted spoils material by means of upland disposal and reuse. If a part of the spoils tested is deemed incompatible and/or contains hazardous levels of any chemical or element considered toxic, such spoils will be disposed of as described below. Remaining spoils that are deemed compatible with the upland disposal and reuse method would be disposed of in that manner.

Spoils materials that are disposed of using the upland disposal and reuse method shall not exceed 1 foot in thickness in the application process and shall meet the water quality requirements of the Central Valley and San Francisco Bay Area (in Contra Costa County) RWQCBs. Specific upland disposal and reuse application and soil integration methods shall be specified in the spoils disposal plan. The Plan will include CALFED Programmatic Mitigation Measures 21, 22, 23, and 30.

Treated (amended) upland disposal and reuse. If the results of spoils tests indicate that the material is incompatible with the composition and chemical properties of the proposed upland disposal areas, and could result in a change in the soils' suitability for continuing use as farm or grazing land but does not contain hazardous levels of any chemical or element considered toxic, such spoils may be disposed of and reused locally with the use of soil amendments. Soil amendments would serve to adjust the composition and chemical properties of the spoils to allow the best integration with the existing soils of the upland disposal and reuse sites to the greatest extent feasible. If a part of the spoils tested contains hazardous levels of any chemical or element considered toxic, such spoils will be disposed of as described in the landfill method below. Remaining spoils that are deemed compatible with the amended upland disposal and reuse method will be disposed of in that manner.

Spoils materials that are disposed of using the amended upland disposal and reuse method shall not exceed 1 foot in thickness in the application process and shall meet the water quality requirements of the Central Valley and San Francisco Bay Area (in Contra Costa County) RWQCBs. Specific upland disposal and reuse application and soil integration methods shall be specified in the spoils disposal plan. The plan will include CALFED Programmatic Mitigation Measures 21, 22, 23, and 30.

Landfill upland disposal. If the results of testing indicate that all or part of the spoils tested contain hazardous levels of any chemical or element considered toxic, such materials shall be handled, transported, and disposed of in accordance with all appropriate health and safety regulations, and with the project's hazardous materials management plan.

DWR and Reclamation will dispose of up to 294,000 cubic yards of decanted spoils material by transporting it to the Altamont Landfill lands currently owned by DWR for permanent disposal. Prior to beginning dredging activities, DWR will ensure that the Altamont Landfill will have adequate capacity to accept up to 294,000 cubic yards of material. If the landfill cannot accommodate the entire quantity of spoils material, the project proponents will identify alternative landfill sites with adequate capacity to accept all 294,000 cubic yards of potential spoils material. Details on handling and transportation methods will be identified in the spoils disposal plan and assessed for impacts by subsequent environmental review (if necessary).

2.4.2.6 Environmental Training

DWR and Reclamation will ensure that training is provided to the construction personnel and managers on the need to avoid and protect environmental resources. Communication efforts and training will occur at preconstruction meetings so that construction personnel are aware of their responsibilities and the importance of compliance.

Construction personnel will be educated on the types of sensitive resources located in the project area and the measures required to avoid impacts on these resources. They will attend an environmental training program before project groundbreaking activities are initiated. Materials covered in the training program will include environmental rules and regulations for the proposed project and requirements for limiting activities to the construction right-of-way and avoiding demarcated sensitive resources areas.

Training seminars will be held to educate construction supervisors, managers, and other field personnel on:

- the need for resource avoidance and protection,
- construction drawing format and interpretation,
- staking methods to protect resources,
- the construction process,
- roles and responsibilities,
- project management structure and contacts,
- environmental commitments, and
- emergency procedures.